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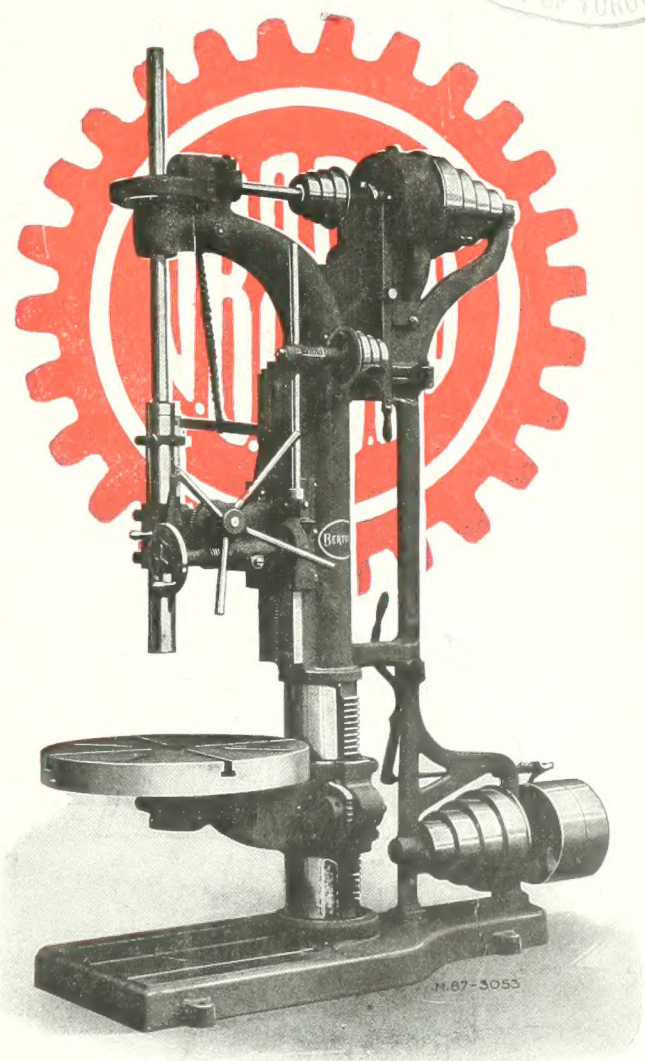
CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 22 Publication Office: Toronto, November 29, 1917 Subscription Price $3.00 per Year

BERTRAM MACHINE TOOLS

30-Inch Vertical Drilling Machine



EXCEPTIONAL speed and accuracy are outstanding features of this tool.

Photographs and full particulars upon request. Write to-day.

Locomotive and Car Shop Equipment.

Structural and Bridge Shop Machinery.

Repair Shop Machinery.

General Machine Shop Equipment.

The John Bertram & Sons Company, Limited

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"Carry On"

Let your money help win the war

"CARRY ON"—That is the watchword of this war. It is the watchword in the trenches; it must be the watchword at home. It is in order to CARRY ON that Canada is floating the Victory Loan. It is to be a People's Loan, available in "small portions," so that every citizen may share in it. And the citizen who subscribes, no matter how much or how little, will be assured of these three great advantages: 1. A high rate of interest. 2. Quick sale for his holding if he later wishes to turn them into cash. 3. Unimpeachable security for his money in the shape of the whole wealth and resources of Canada. But, best of all, by *Lending His Bit* he will be *Doing His Bit* and helping the Dominion to CARRY ON.

Buy Victory Bonds

BUY MORE VICTORY BONDS

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Canada's Victory Bonds

Better than Money in Your Pocket

A Victory War Loan Bond is real money—just as real as the Bank notes you carry in your pocket. The $5 Bill in your pocket is nothing but a Bond—the government's promise to pay five dollars in gold. The only difference is that a Victory Bond is live, working money, earning 5½ per cent. which the Bank note in your pocket does not do.

Remember, too—that Victory War Loan Bonds are exchangeable dollar for dollar, for any later Bond which the Government may issue during the war which pays a higher rate of interest than 5½ per cent.

Some people have the idea that to invest in a Victory Bond is to tie the money up—that is not so. Victorys are readily saleable anywhere—at any time. If you ever are in need of your money take your Victory Bond to any Bond Dealer—he will sell it for you for cash.

Buying Victory War Loan Bonds is the strongest and safest investment one could make. All Canada is your backer—the entire resources of the country are your security. It gives you an opportunity to express the highest ideas of patriotism—save your money and serve your Empire at the same time—your plain duty lies straight ahead.

Buy Victory Bonds To-Day.

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BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

The Publisher's Page

TORONTO November 29, 1917

To Maintain Industrial Activity
Subscribe Liberally for
Canada's Victory Bonds

IF for no other reason than that of self-interest, it is of the utmost importance to every manufacturer and merchant that the fourth War Loan of the Dominion of Canada (known as Canada's Victory Loan and now being offered) be fully subscribed.

The further extension of credits to our Allies is imperative if Canada's manufacturers wish them to continue buying here. And there can be no question about that, because upon their purchases will depend our industrial and agricultural prosperity.

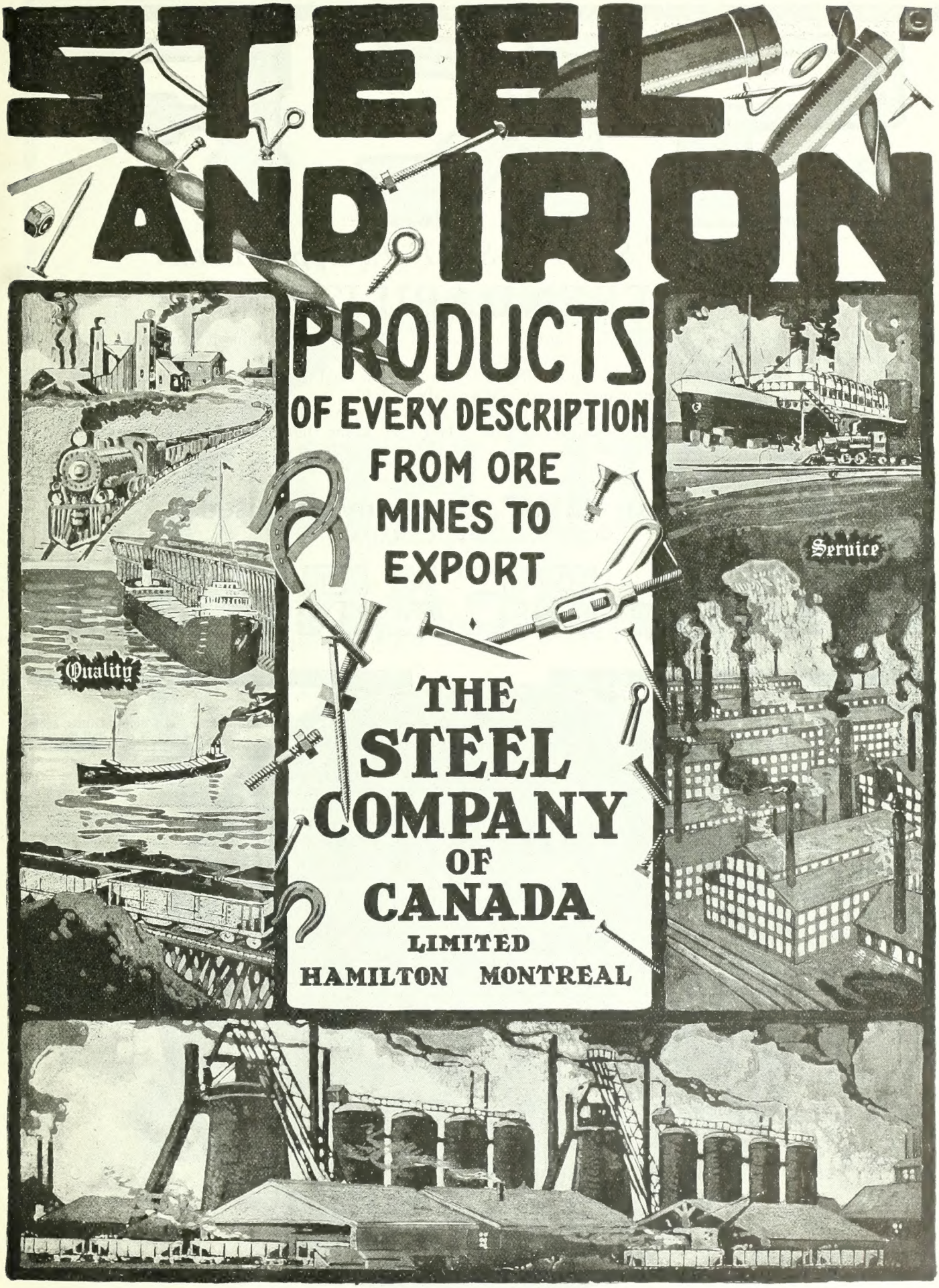
Then, too, the money subscribed will be spent in Canada.

The money must come from our entire people, but a good lead from manufacturers and merchants is absolutely essential and will encourage the multitude of smaller investors. The bonds are an excellent investment. Money is not tied up in them, because they are readily saleable and because of their value as collateral.

Apart from all business and financial reasons, however, the great fact remains that Canada must have more money to carry on her part in the war.

Every ounce of our financial, as well as fighting strength, is needed.

Great Britain must now purchase where she can get credit. If Canada grants the credit---she will get the business.


STEEL AND IRON
PRODUCTS
OF EVERY DESCRIPTION
FROM ORE MINES TO EXPORT
Quality
Service
THE STEEL COMPANY OF CANADA
LIMITED
HAMILTON MONTREAL

SKF

No. 1 of a Series of S K F Equipped Lathes

DEPENDABILITY

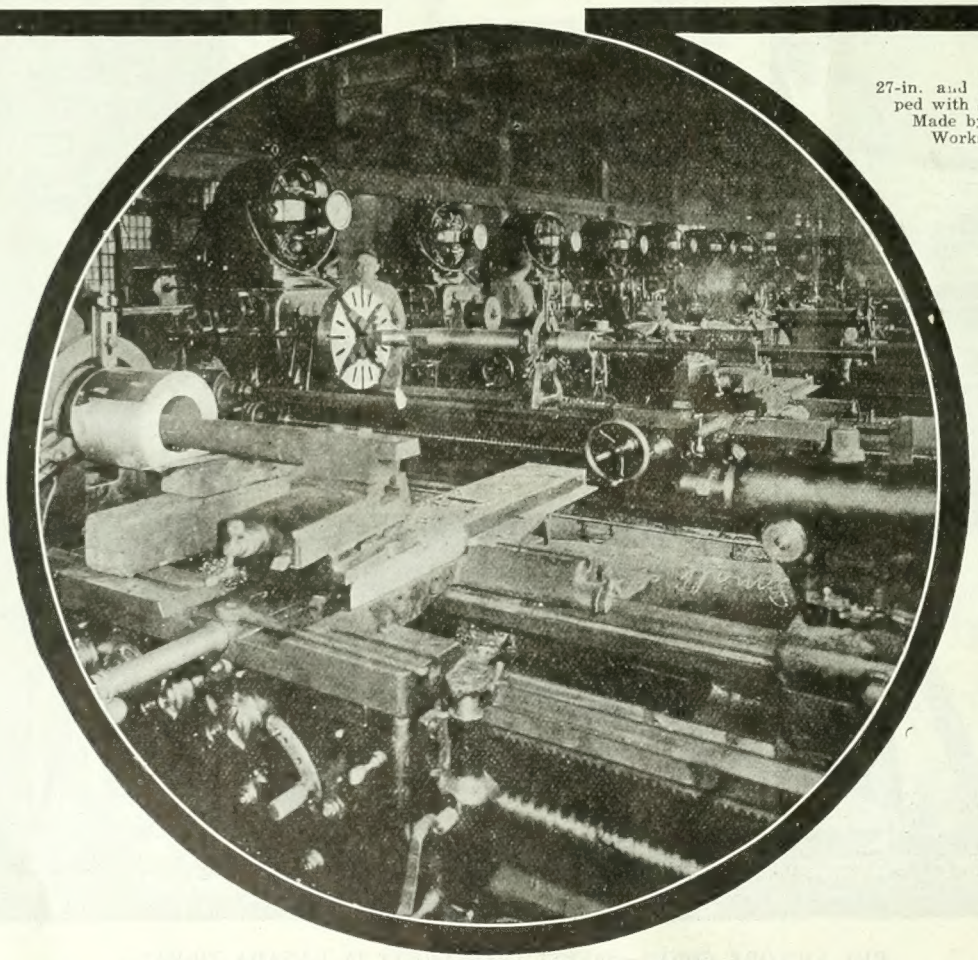
Every lathe you sell carries with it your reputation. If it is found dependable it is upheld. If it develops wear, shake, looseness, your name suffers.

If your lathe develops play—in the spindle, the gear box, the feed mechanism—it is because you have failed to choose a bearing whose quality makes it dependable.

Designers who want a bearing on which they can depend choose S K F. They know our Engineering Staff makes dependable recommendations. And they know that, used as designed by our Engineers, S K F knows no superior.

Canadian SKF Company, Limited
TORONTO, ONT., CANADA

BALL BEARINGS



27-in. and 30-in. Lathes equipped with S K F Ball Bearings. Made by the American Tool Works Co.

STELLITE

WELDING COMPOUND

"We have been using 'Stellite' Welding Compound for the past month, obtaining excellent results. We have tried other compounds for tipping and are pleased to report that to date best results have been obtained from the use of 'Stellite' Welding Compound."—**Canadian Linderman Co., Limited**

DELORO SMELTING & REFINING COMPANY, Limited

Head Office: DELORO, ONTARIO

TORONTO MONTREAL

OUR GOVERNMENT will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed.

Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—we spare no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced.

It's best for all machine work.

VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA.
Works at LATROBE, PA.

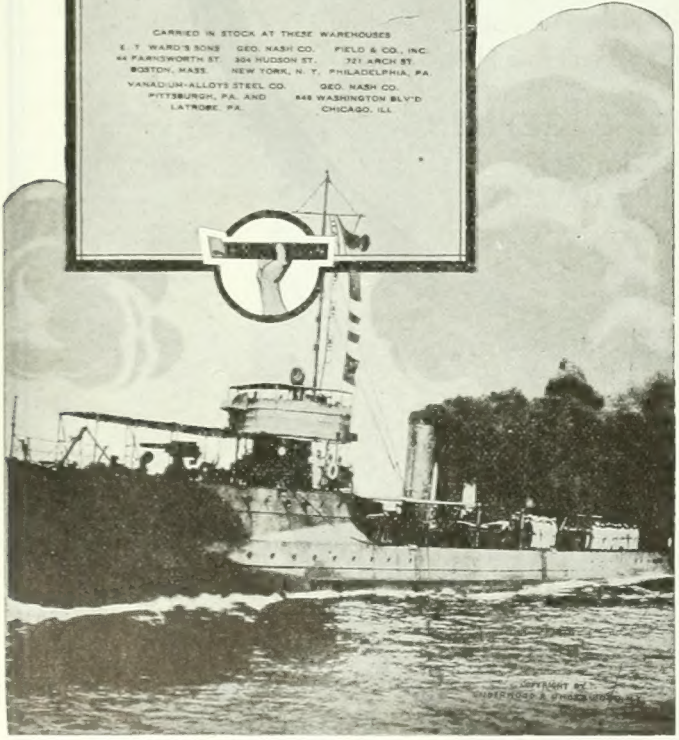
CARRIED IN STOCK AT THESE WAREHOUSES

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA. AND LATROBE, PA. — GEO. NASH CO., 848 WASHINGTON BLV'D, CHICAGO, ILL.

U. S. S. Warrington, torpedo boat destroyer, the type of vessel that safely escorted Major General Pershing and his staff to England.

This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare.

Passed by the Censor



If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for our mailing list

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are **warranted to be super-keen at the edge and super-strong at the neck.**

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

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Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and **the introduction of Uranium**—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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High Speed Steel

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MALLEABLE CASTINGS

Capacity
Two Thousand Five Hundred Tons per Month

Our Prices, Quality and Delivery are Right

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Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

Hyde Engineering Works
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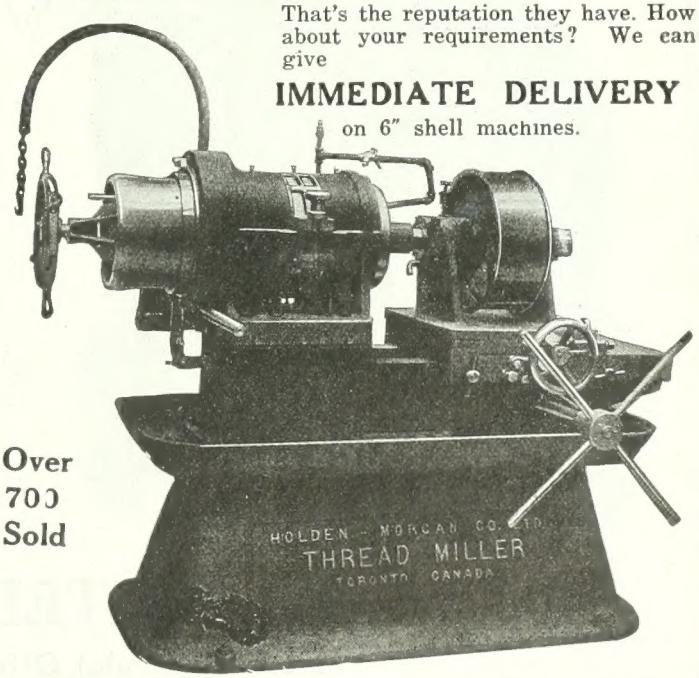
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

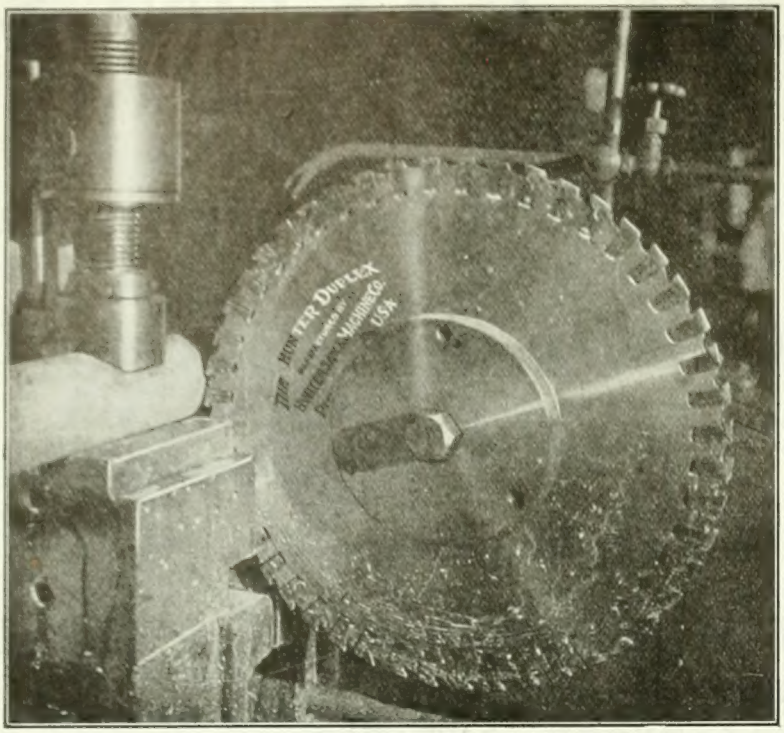
IMMEDIATE DELIVERY
on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.
W. FRONT ST. (Limited) TORONTO

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

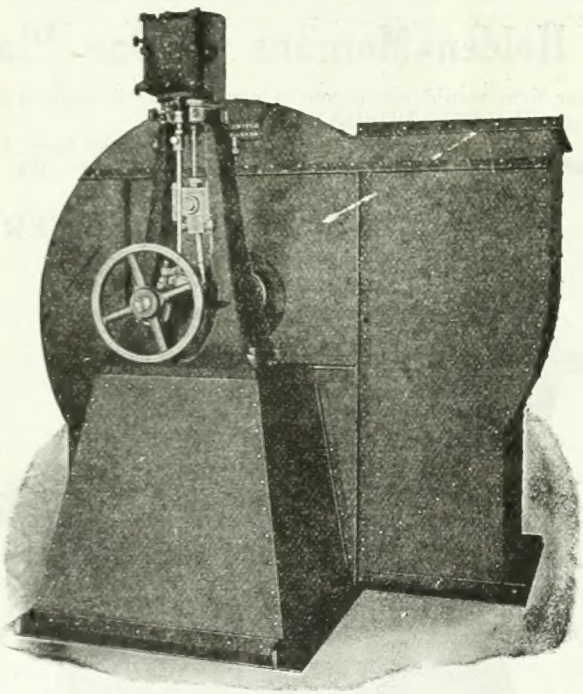
2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably — on shrapnel or any other stock.

Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.



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"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

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We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements

The Jenckes Machine Company, Limited

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HIGH SPEED STEEL

We have often been asked, "What gives Uranium High Speed Steel the toughness and strength not found in the ordinary high speed steel?" The answer is that by combining the proper amount of uranium to our mixture a high speed steel of the finest quality is produced—a steel that works at greater speeds, takes deeper cuts and lasts longer.

Consult your steel man or write us for full details.

STANDARD ALLOYS COMPANY

FORBES AND MEYRAN AVES.

PITTSBURGH, PENNA.

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"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

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Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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Steel Ingots
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HARMET
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Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
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Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
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CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

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We carry a complete stock at our Montreal Warehouse

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Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates
Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN

King Edward Hotel, TORONTO

We guarantee shipment within 24 hours of receipt of order

SISCO

"Extra" "Special" "High Speed" Tool Steels

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.

MONTREAL, QUE.

UNIFORMITY

USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL
ADAMUS
TENAXAS
ATLAS
DURASTIC
MASCOT
TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

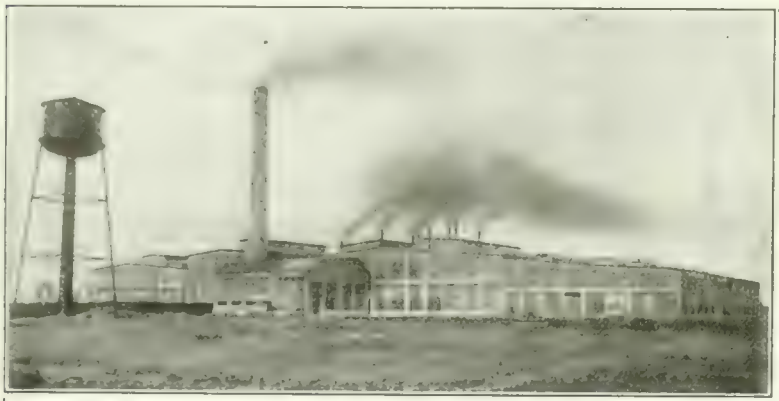
No Shock Too Severe No Load Too Heavy No Speed Too Great

ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. TORONTO: 86 Richmond Street East.



Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

Carried in Stock

CARBON AND ALLOY STEELS

Shop Tools, Gauges, etc.

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
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Coal
Coke
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Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
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M.A. HANNA & Co.

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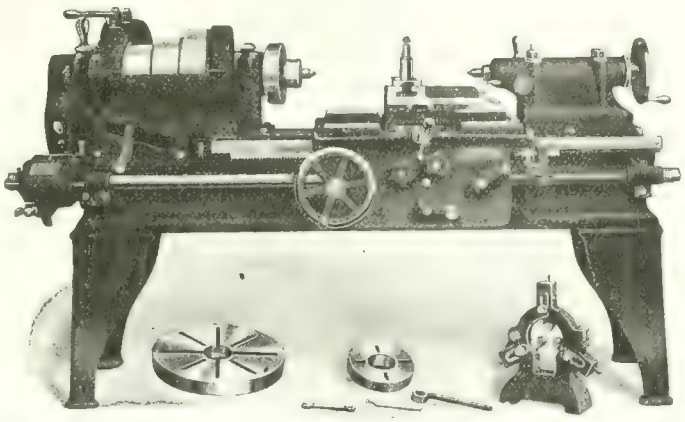
BUY VICTORY BONDS SAFEST INVESTMENT IN CANADA TO-DAY.

LOOK—Lodge and Shipley Engine Lathes

IMMEDIATE SHIPMENT

SIZE
14" x 6' or 8' Bed.

Double Back Gears and Quick Change Gear Box.



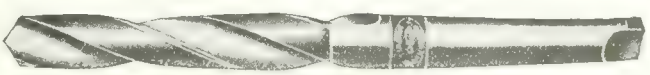
If *you* can use this size lathe, write for specifications and prices. Remember these are the highest quality tools manufactured.

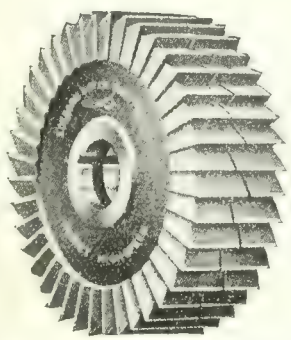
GARLOCK-WALKER MACHINERY CO., LTD.
32 FRONT STREET WEST, TORONTO, ONT.
"EVERYTHING IN MACHINERY"

DOUBLE
MUSHET
High Speed Steel

Carbon Steel
Gauge Steel
Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD





Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
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Head Office and Works: Montreal, P.Q.
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IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shell. Prices and deliveries on application.

IMMEDIATE SHIPMENT

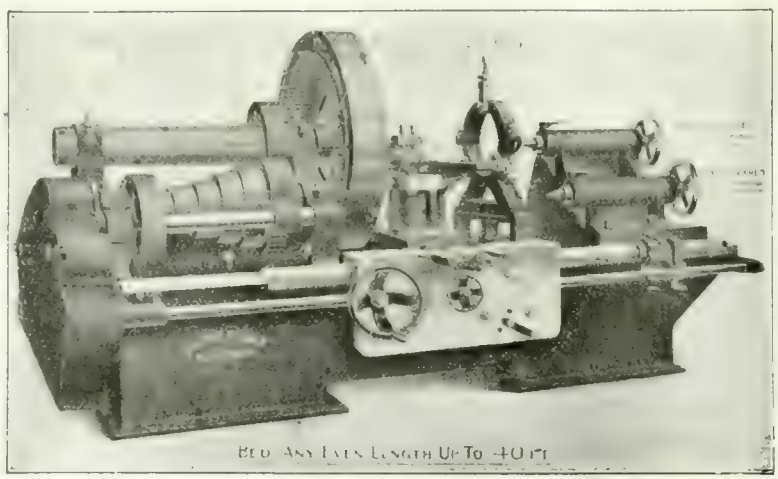
30-ft. BED

McCabe 2-in-1 Lathe

26 and 48-INCH SWING

TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway, New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-Spindle Lathe—26/48-in. Swing.

48-in. Swing. Triple Geared — ratio 72 to 1.

26-in. Swing. Back-geared.

Turns between centers—24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

Prominent shipbuilders are using McCabe Lathes on long beds.

Thousands in operation all over the world.

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK "WACO"

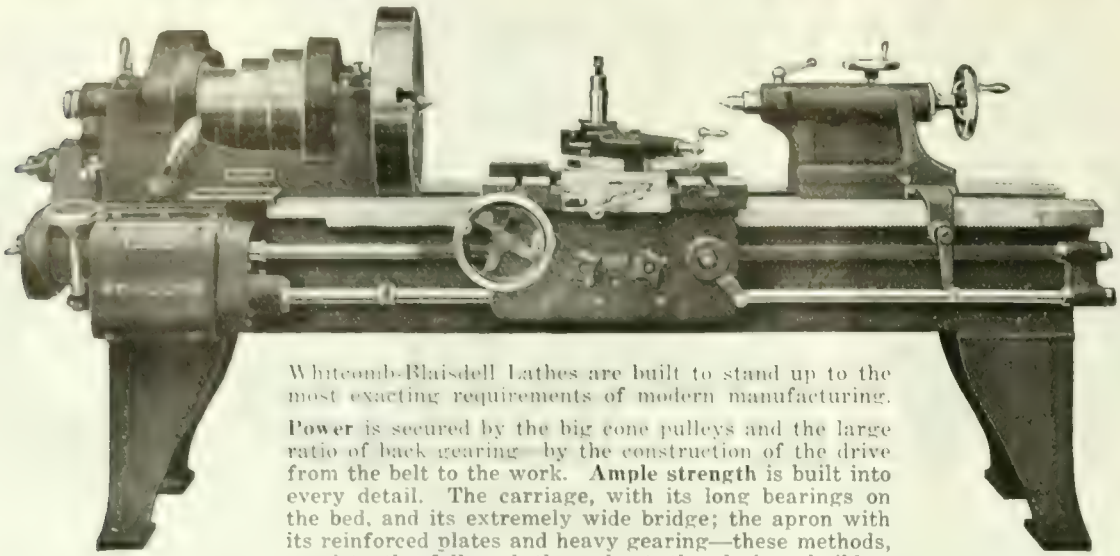
TRADE MARK

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

With Strength and Pulling Power

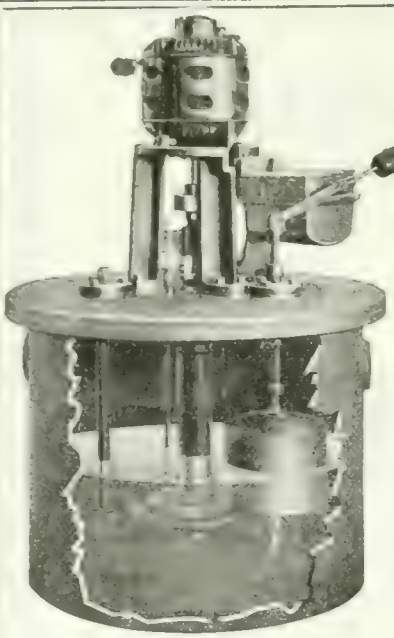


Whitcomb-Blaisdell Lathes are built to stand up to the most exacting requirements of modern manufacturing.

Power is secured by the big cone pulleys and the large ratio of back gearing—by the construction of the drive from the belt to the work. **Ample strength** is built into every detail. The carriage, with its long bearings on the bed, and its extremely wide bridge; the apron with its reinforced plates and heavy gearing—these methods, consistently followed throughout the design, build a powerful, durable machine tool.

Write for Catalog giving full details.

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., U.S.A.



We will appreciate an opportunity to figure on your

PUMP

requirements.

Vertical and Horizontal

Steam and Power

Come to the help of your Country by buying Victory Bonds.

The Smart-Turner Machine Co.

Limited

HAMILTON, CANADA

Decidedly Quality

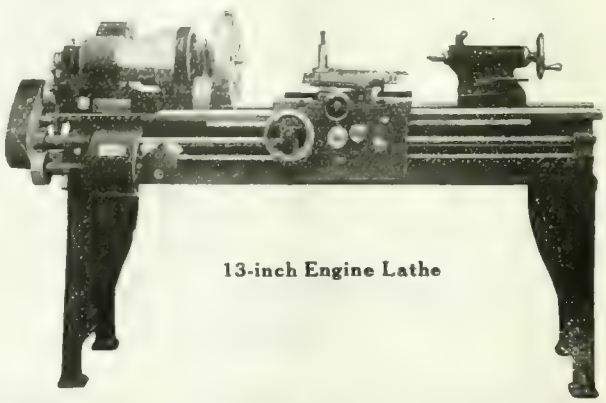
That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United Staes you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

THE PHILIP SMITH MFG. CO.

SIDNEY, OHIO, U.S.A.



13-inch Engine Lathe

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

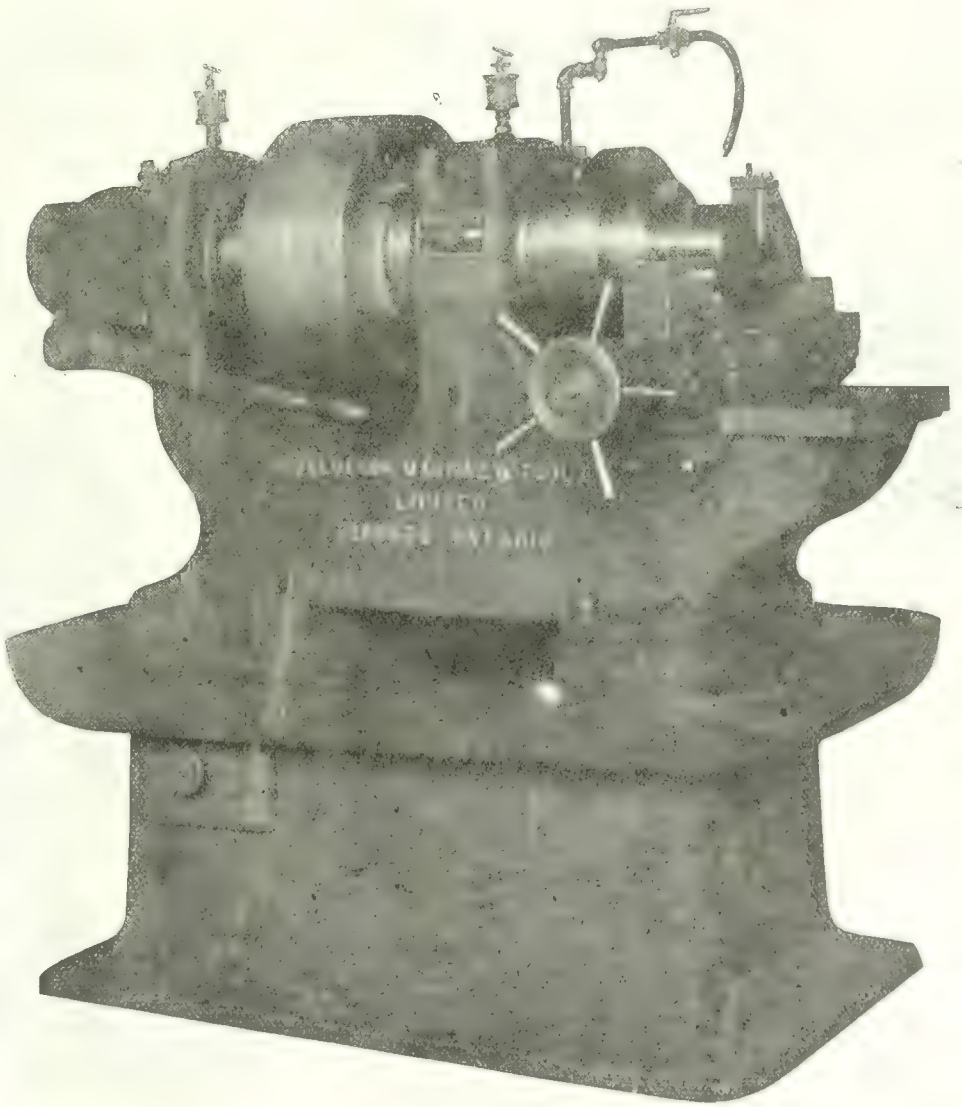
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



HAVE you examined the patented Ball Joint Connection on the smaller Consolidated Presses? This ball joint is instantly adjustable for wear, all lost motion can be eliminated by loosening the locking screws and adjusting the ball cap downward—no machining or filing required.

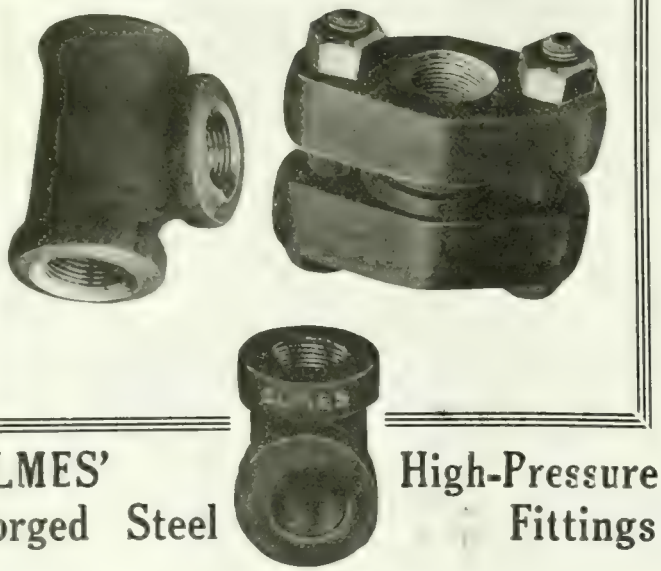
There is another important feature in considering this connection. The ball cap and adjustable split bushings can be removed from the connection screw without removing the screw from the connection or disassembling any other parts.

That is economy that cannot be overlooked.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES' Forged Steel High-Pressure Fittings

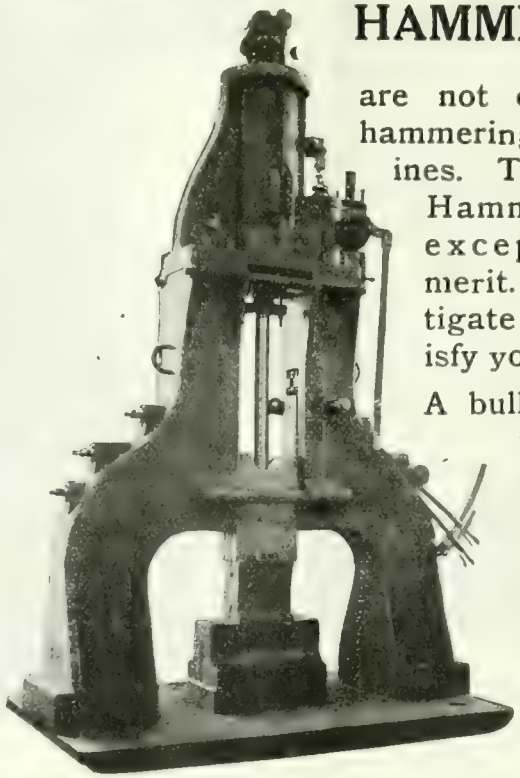
They are made after a thorough study of the requirements of these fittings. Our manufacturing knowledge of the machines these fittings are for has given us an intimate knowledge of the strength required.

Write us for full information, prices, etc.

Charles F. Elmes Engineering Works

217 N. Morgan St. - Chicago, U.S.A.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY

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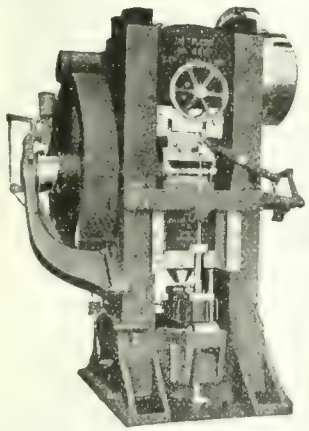
"THE TOLEDO"

Knuckle-Joint Embossing and Coining Presses



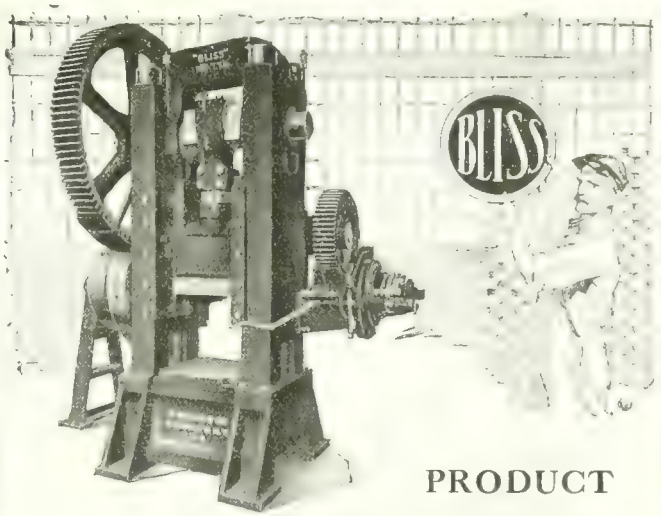
For heavy embossing and swaging on coins, medallions, watch cases, name plates, hardware specialties, cold forging and other work requiring a slow, powerful pressure.

Toggle links so actuated that pressure comes against solid metal, relieving the gibs of all side strain and guiding the dies with great accuracy. We make a study of each particular problem and fit the press to the needs.

The Toledo Machine & Tool Co.

Toledo, Ohio

Representatives Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

BLISS 1857 — E. W. BLISS CO. — BLISS 1917

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For Applying Internal Pressure Physical Test to Shells

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For Pressing in Copper Rotating Bands on Shells.

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Designers and Builders of High Speed Hydraulic and Special Machinery for all Purposes

Complete Hydraulic Installations

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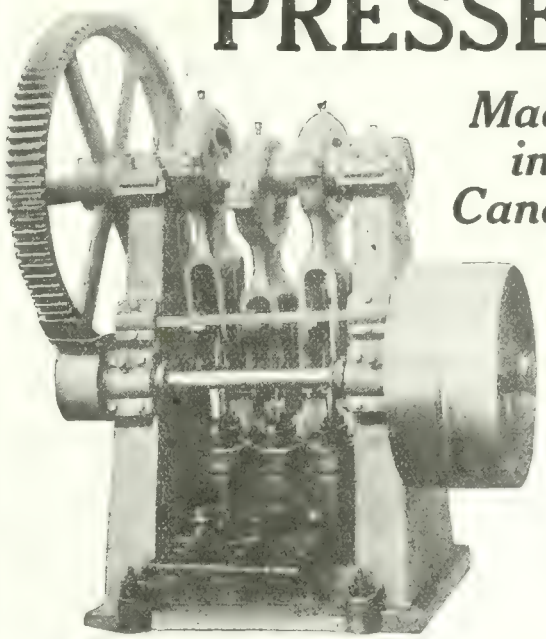
R. E. Ellis Engineering Co., 549 Washington Blvd., Chicago, Ill., Sales Representatives. For Great Britain and Continent, address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Made in Canada



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited

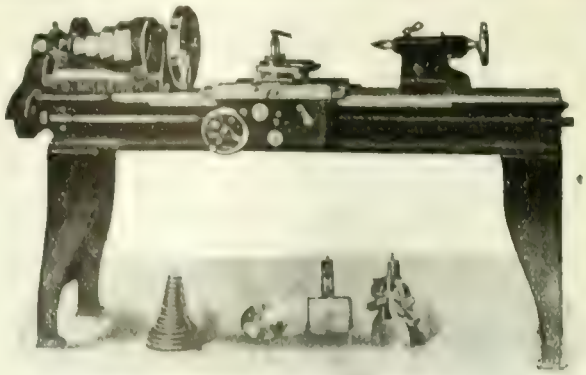
TORONTO, CANADA

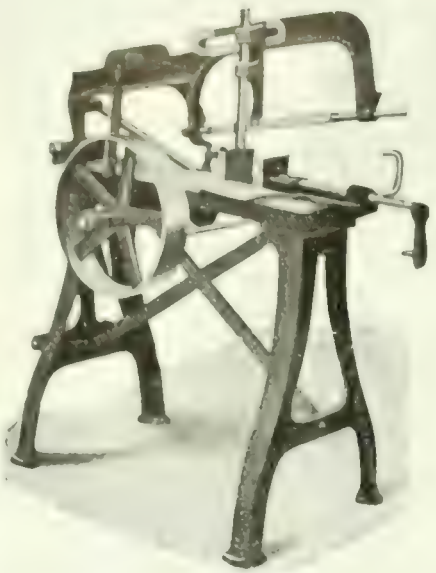
The "McKenzie" Engine Lathe

The Standard of Accuracy

Made from new patterns of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished. Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!





The Improved Power Hack Saw

will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

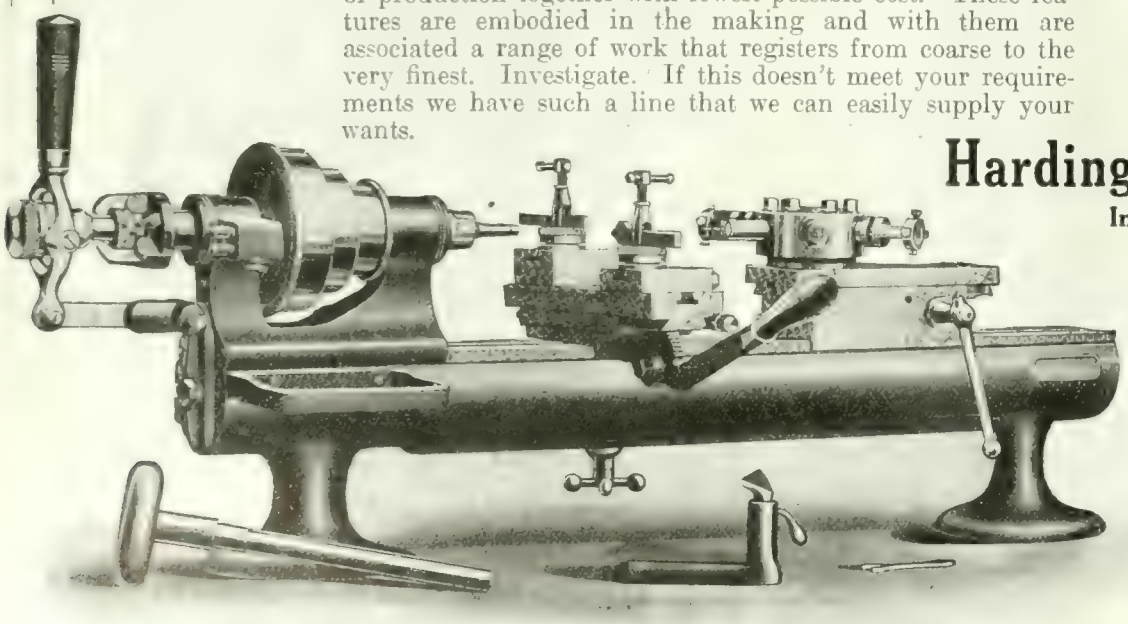
The Improved Saw Guide is a Special Feature — it keeps the saw perfectly in line at all times.

The D. McKenzie Machinery Co.

Guelph, Ontario

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.

Inc.

1770 Berteau Avenue,

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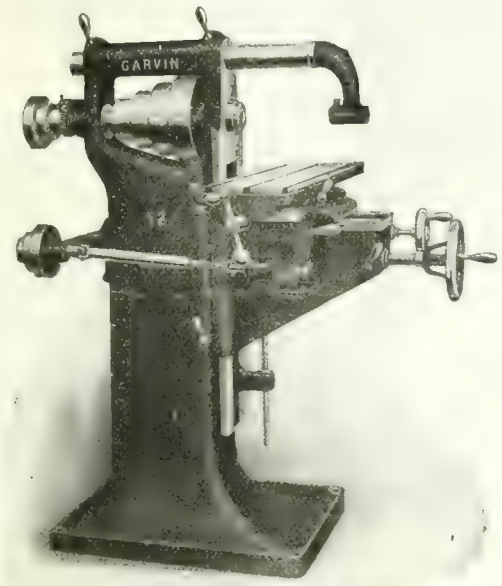


No. 12 Plain Milling Machine—Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

Two Cuts at One Time

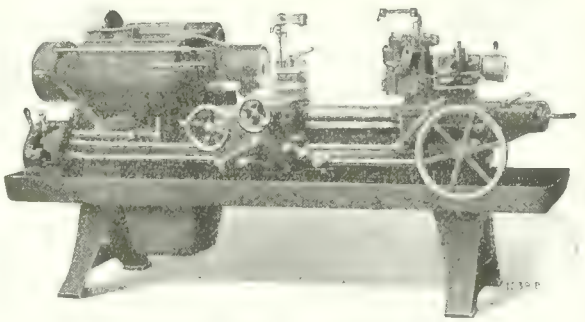
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

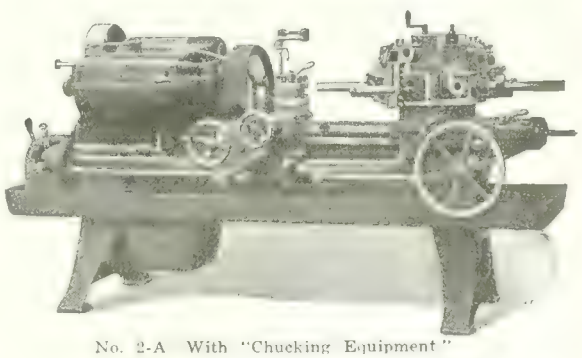
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A With "Chucking Equipment"

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

Two Cuts Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.

Cutting-off Economy

5-inch Cone-Driven Machine

Let us go into details.

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

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Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
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The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company
Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
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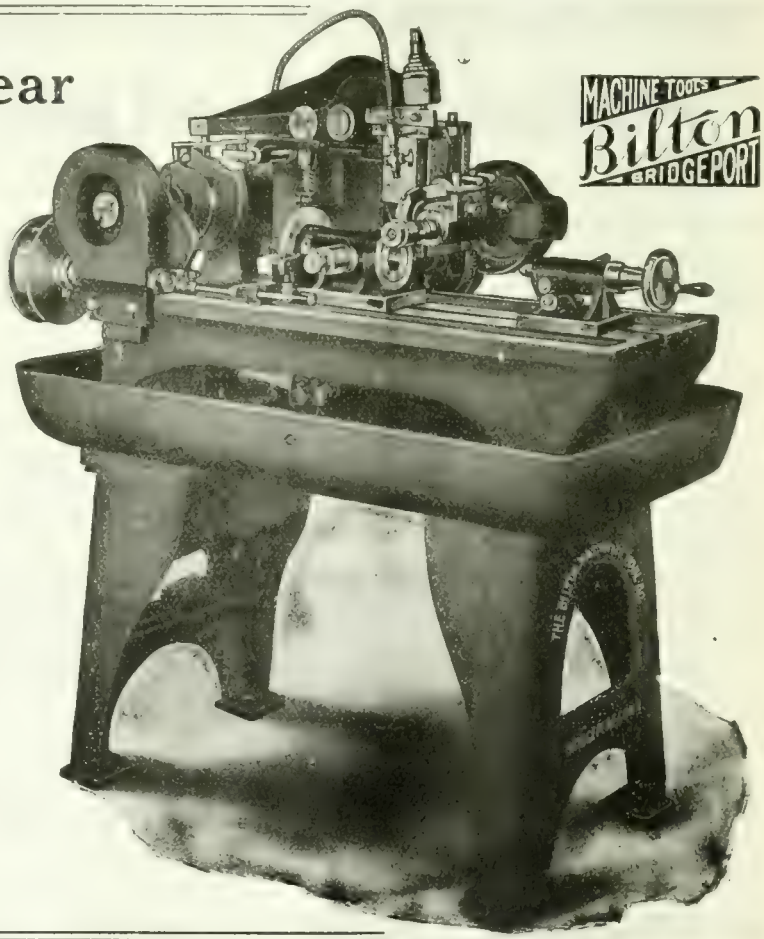
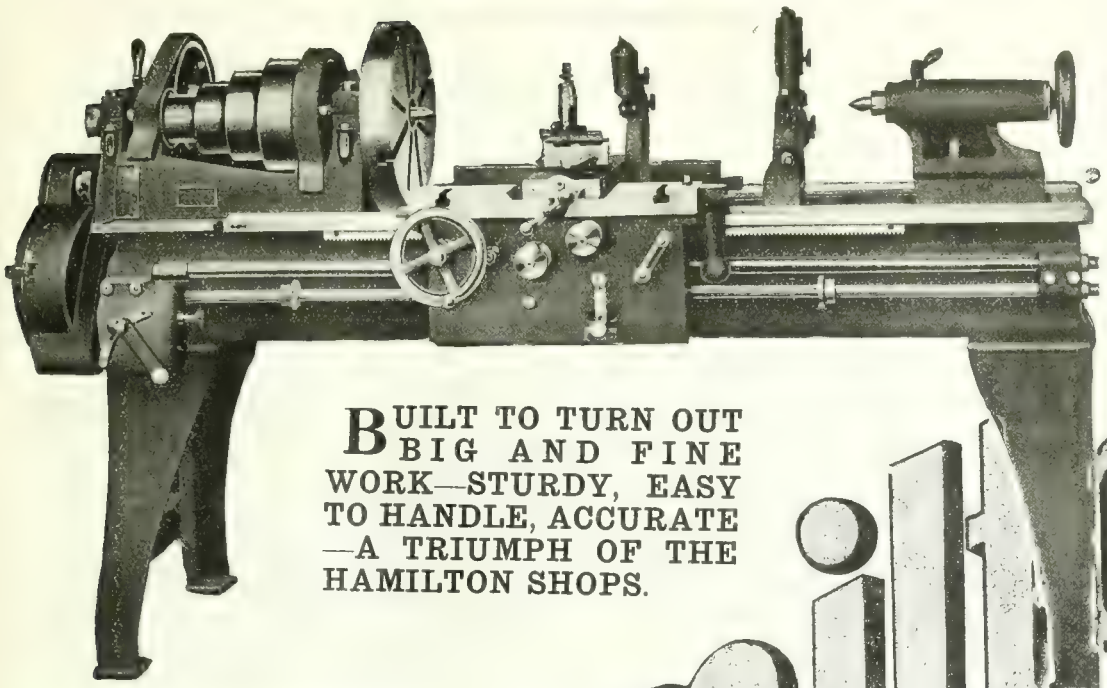


BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.



BUILT TO TURN OUT BIG AND FINE WORK—STURDY, EASY TO HANDLE, ACCURATE —A TRIUMPH OF THE HAMILTON SHOPS.

Hamilton

"The Distinguished Service Lathe"

In this Lathe you see exemplified the skill of expert workmen with years of "Hamilton" experience—experience which means something. It is a lathe that well represents the best of our high-class machines—a lathe most carefully constructed with lasting materials—a lathe that turns out work of the calibre of its own ideal construction.

The illustration shows the sturdy, easy working "Hamilton" complete with equipment — single back gears, hollow steel spindle, self-oiling bronze boxes, power cross feed, chasing dial, quick change feed box, automatic stop for feed. There is a good deal more we can tell you about this profit-making quality worker. Write to us and we will send you interesting literature.

Rapid Production HAMILTON Machine Tools

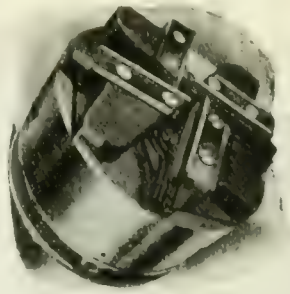
FOR 25 YEARS MAKERS OF FINE MACHINE TOOLS

The Hamilton Machine Tool Co.

HAMILTON, OHIO

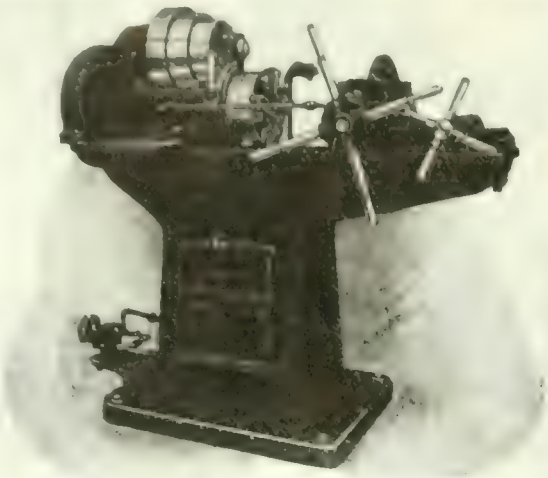
Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Landis Threading Method Means Less Labor



As labor becomes scarce and wages increase, industry requires the most efficient and most economical machine for every line of work.

Meeting that condition in regard to thread-cutting is the **Landis Threading Machine** or **Die Head** for bolt, pipe and special threads. The Landis Die can be used advantageously for cutting every thread in your shop. No matter what form of thread, pitch or shape of the part to be threaded, the Landis will handle it to your complete satisfaction. Many threading jobs which were formerly done on lathes are now threaded with a Landis die head or machine and the results are **equal accuracy, a higher production and a lower threading cost.**



One customer writes:—"We have made an increase in production of 30 to 40% and a savings in the cost of chasers of 50 to 60% since installing your machine."

Does not that prove the efficiency of the Landis Threading Method?

Write for catalogues.

No. 22—Bolt Threading Machinery.

No. 23—Pipe Threading Machinery.

Landis Machine Company

WAYNESBORO, PA.

Exclusive Canadian Agents: Williams & Wilson, Limited, Montreal

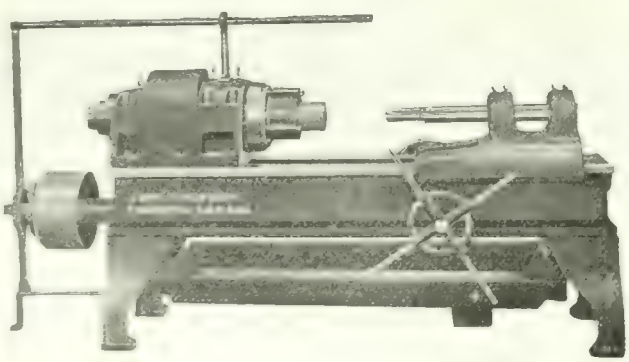
Boring 6" Shells

with

Perfectly accurate boring and far greater speed go into your shop the day you open the door to a Hepburn Single Bar Boring Lathe of rigid build. No lathe in your shop or any shop other than a Hepburn Lathe is its equal on 6" shell work. Write for its record.

Your old lathe rebuilt by us will be as efficient as new for all lathe work. Ask for particulars.

Hepburn Lathes



John T. Hepburn, Limited

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PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

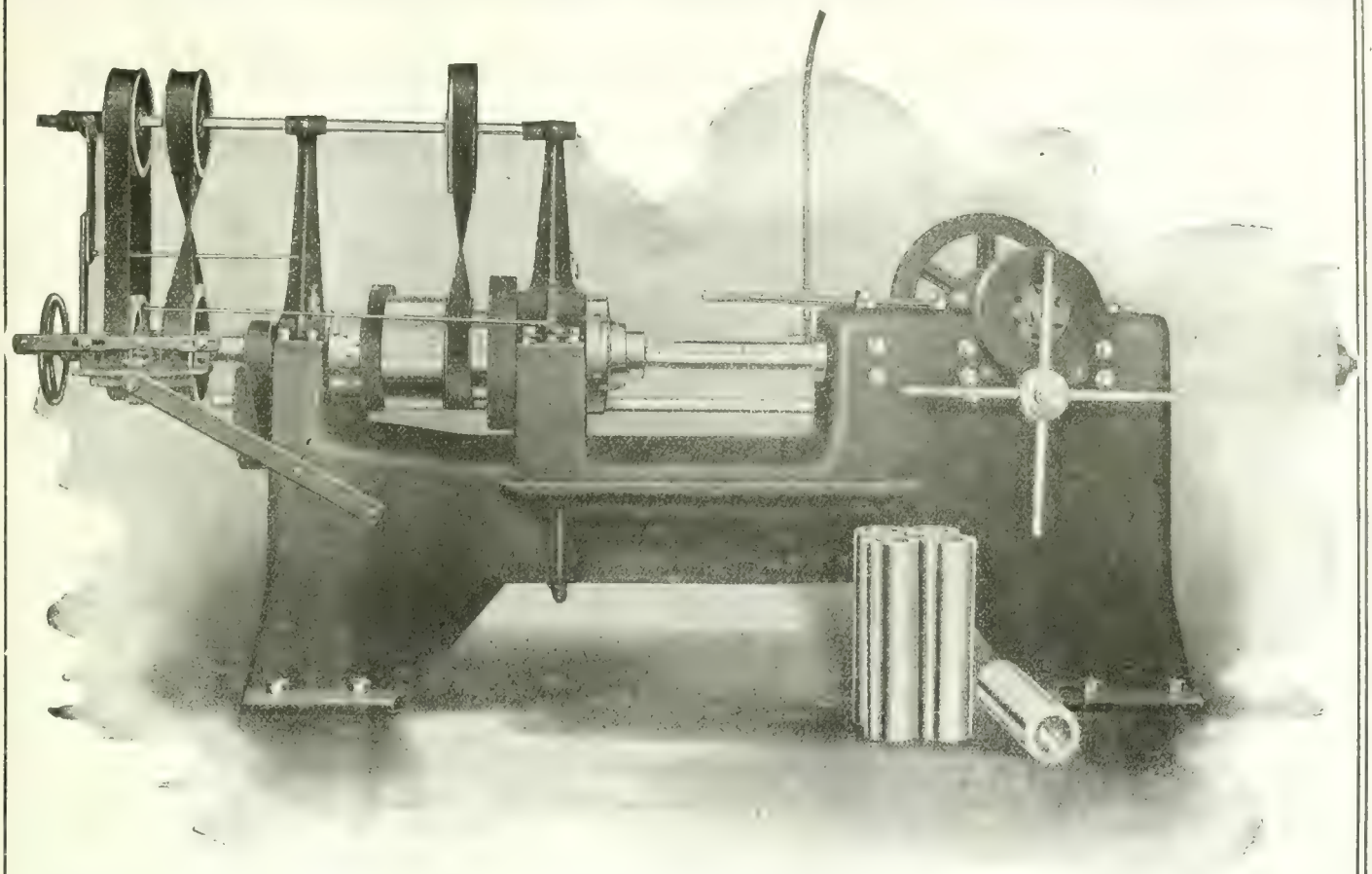
We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.

NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.



Cutting 6" Shell Costs

A Complete Rough Boring Unit with Patented Automatic Screw Chuck.

Convincing Facts:

Rough Bore **75** shells per 10 hour day.
Finish Bore **100** " " " " "

Study illustration, compare these figures with your own present output, then write us for complete data and specifications. An entirely new machine with entirely new results.

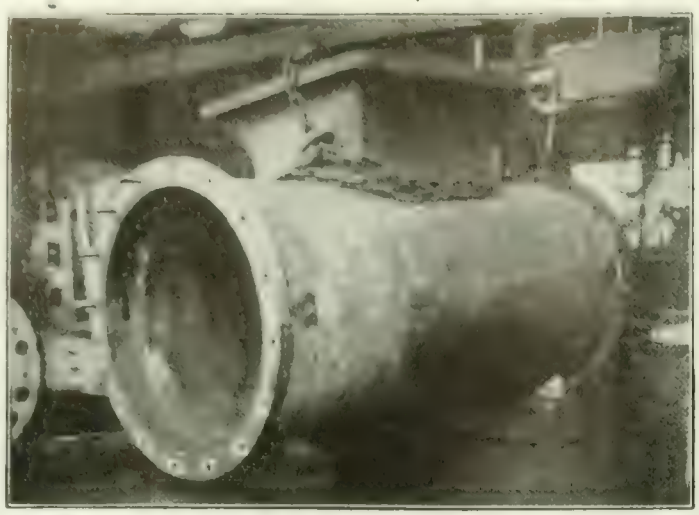
The Plessisville Foundry

Plessisville, Que., Canada

Cylinder Built by Oxy-Acetylene Welding

A Maximum of Efficiency at a Minimum of Cost

This Cylinder was built entirely by the Oxy-Acetylene Process, and, submitted to careful and methodical tests under actual working conditions, was found to be more than equal to any strain to which it could reasonably be [illegible] The accumulated evidence that Oxy-Acetylene Welding is suitable for practically every purpose involving the joining of metals is overwhelmingly proven, and is the best proof of its successful application to your industry.



Your problems may be of lesser or greater magnitude than this, but a thorough investigation of the Oxy-Acetylene Process will more than convince you of its undoubted advantages and money-saving possibilities to you. For emergency repair work and the reclamation of broken machine parts it is absolutely indispensable and of incalculable value, not only saving many times its cost of installation, but obviating costly "tie-ups" when replacements are difficult or impossible to procure.

Our experience is yours for the asking. Why not investigate to-day?
It is only necessary to attach this ad. to your letterhead and mail to us. Full particulars will be sent by return.

The Pioneers of the Process with factories all over the world.

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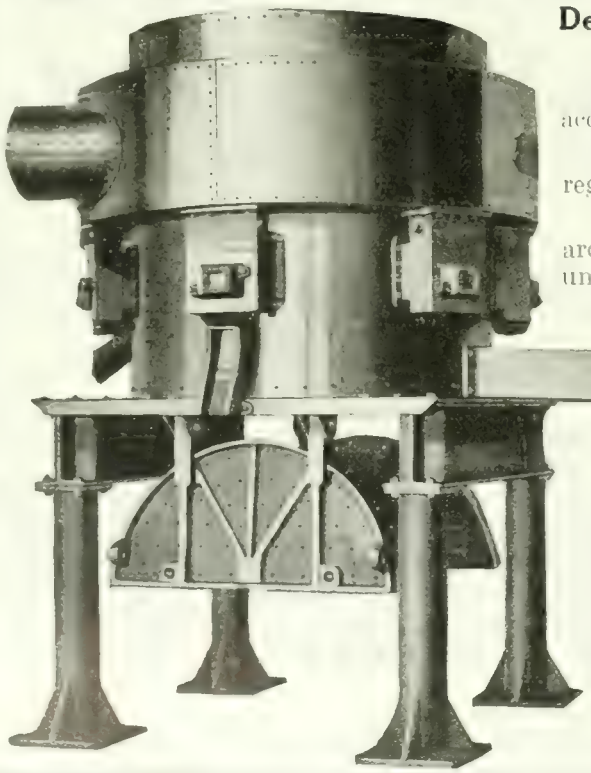
TORONTO MONTREAL WINNIPEG HALIFAX (Under construction)

Manufacturers of Oxygen and Dissolved Acetylene and all requisites for the Process.

SPECIAL WHITING CUPOLA



Designed specially for pipe, car wheel and all foundries requiring long continuous heats.

Individual tuyere boxes with ample openings give easy access to tuyeres during the heat.

Each tuyere is supplied with individual damper for blast regulation; also with large side and bottom clean-out doors.

Tuyere openings through lining are large and continuous around entire circumference of cupola, giving soft blast and uniform melting.

Bottom plate is of heavy steel plate with cast steel hinges.

Many in operation to-day.

Send for Cupola Catalog No. 131

Complete Foundry Plants — Cranes of All Kinds

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

INGOTS

Brass, Bronze and Composition

Any Alloy According to Your Formula

ALSO

INGOT-COPPER

99.9% PURE

For High-Grade Castings

Wire or Write for Prices

We are Purchasers of Copper Bearing Material

BROWN'S COPPER & BRASS ROLLING MILLS, LIMITED

NEW TORONTO, CANADA

Near Toronto

Starrett Hack-Saws

STARRETT HACK SAWS CUT QUICKER LAST LONGER

In a shop such as this, you will surely find many Starrett Tools. With our reputation for fine precision tools, we could not muster up courage to put our name on a hack saw that is second to any obtainable. We know that

Starrett Hack Saws Are Unexcelled Just As Starrett Tools Are Unexcelled

We make them in our own shops; in the same plant with Starrett Tools. We know what steel they are made of. We know what they will do, for we test saws all the time under known conditions. With us it is test, test, test to find out for you just what constitutes the best saw for this work or for that.

There is no question about the quality of Starrett Hack Saws. The only question is what numbered saw to use and this question is easily answered by referring to page 208 of our Catalog No. 213, which shows what saw to use for any particular work.

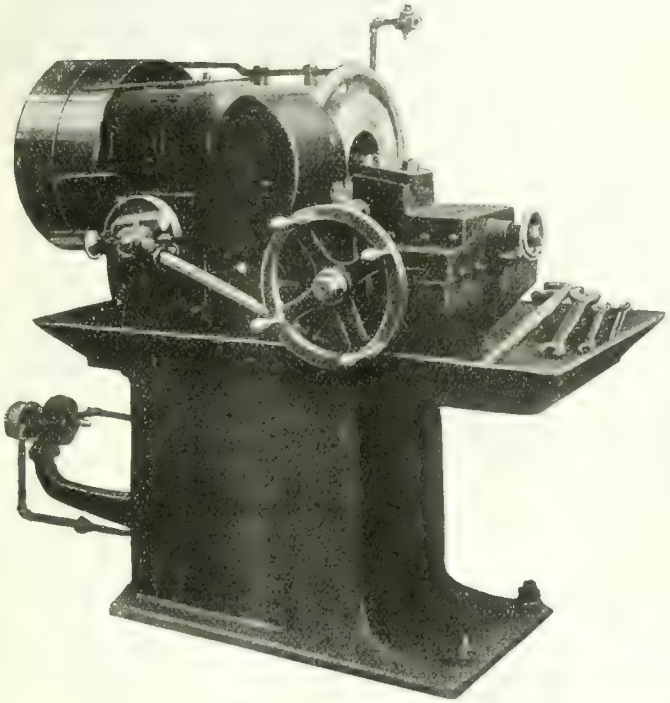
The L. S. Starrett Co.
The World's Greatest Toolmakers
ATHOL, MASS.
NEW YORK LONDON CHICAGO

42-748

STARRETT

Cut Quicker-Last Longer

6″ Light
Base Facing
Machine



Another Worthy Victoria Product

THIS machine has proved itself a first-class investment.

Well-Designed
Carefully Built
Sturdy and Efficient

IT is a conclusive argument in favor of special purpose machines.

Space required 4x7 feet.
No countershaft required.
Approximate weight, 2000 lbs.

Victoria Foundry Company Limited

OTTAWA - - ONTARIO

For Rapid Production and Accurate Work

USE THE

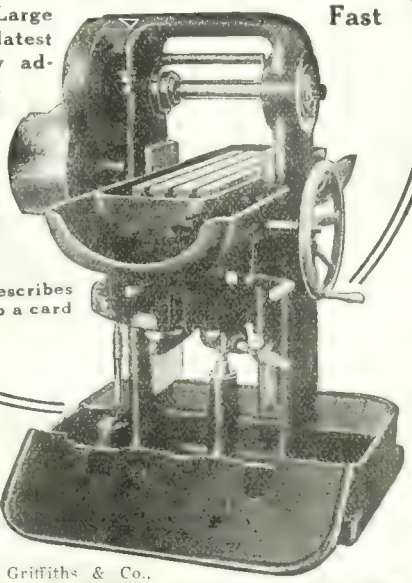
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant.

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

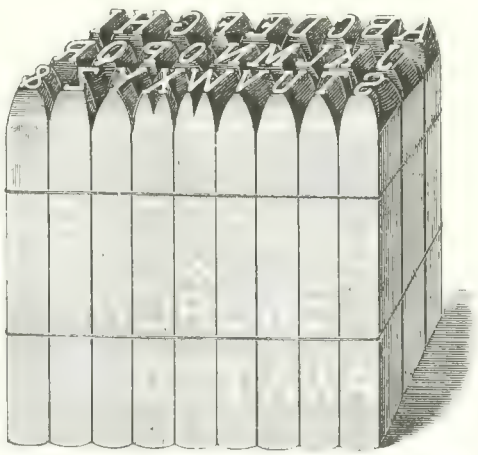
Fast



Our booklet describes fully. Drop a card for it.

Gooley & Edlund
Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia. San Sebastian, Spain.



STEEL STAMPS

FOR MARKING SHELLS, ETC.

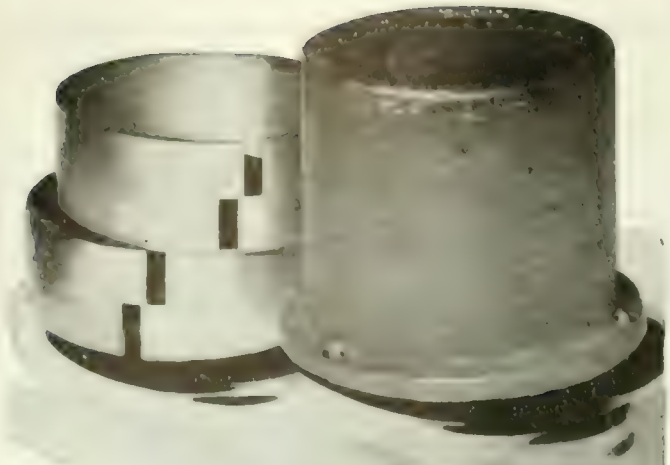
We will Give You Satisfaction on All Work of this Kind

SEND FOR PRICES

Pritchard-Andrews Co., of Ottawa

General Engravers and Die Sinkers

264 SPARKS ST. OTTAWA, CANADA



Grinding Rings For Silent Knight Motors

is a small job and yet a big one, which demands the correct grinding wheel and the utmost care on the part of the operator.

The castings is rough turned—internally ground—slotted on a miller—and then finished to a limit of .00025" with an ALUNDUM wheel removing .015 to .020" of stock.

Just as this concern's grinding problems have been successfully solved by using ALUNDUM so can each one of yours.

Send us your address for a number of interesting and helpful pamphlets on grinding.

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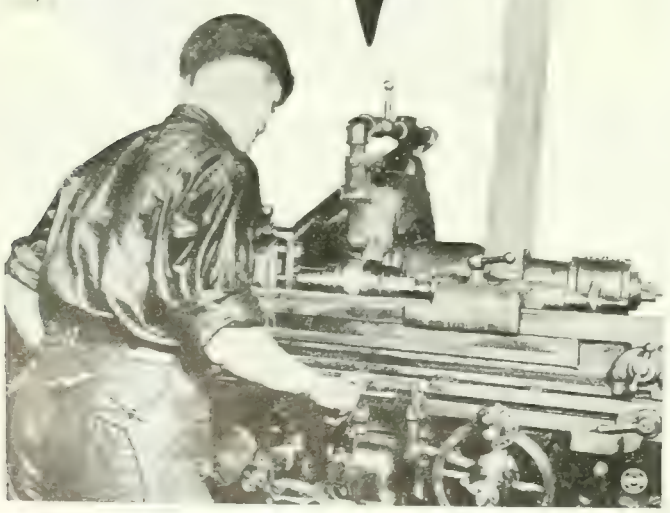
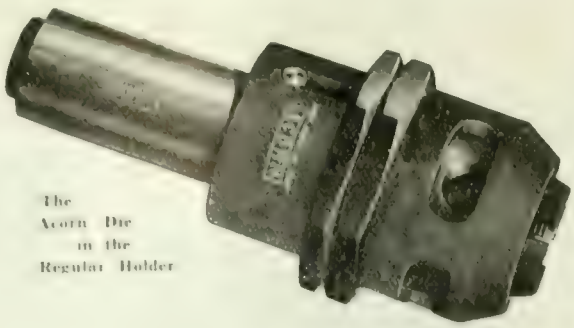
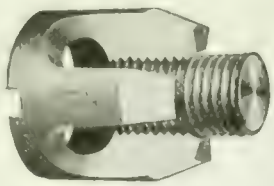




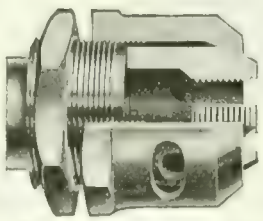
The Acorn Die in the Regular Holder

THE ACORN DIE



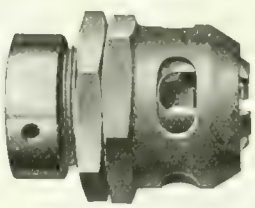
The Die

Accurate adjustment of the ordinary spring or round die is impossible. Some lands will do more cutting than others. You know the result—threads rough and inaccurate in lead and diameter.



Sectional View Showing Adjustment

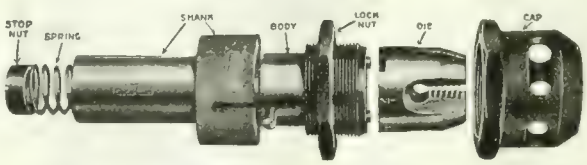
With the Acorn Die all this is overcome by a new method of adjusting. Very accurate adjustment can be obtained by simply turning the cap, which threads on to the body, on or off part of a turn. This cap is bevelled on the inside and fits a corresponding bevel on the nose of the die, so that when the cap is turned all four prongs are forced in or allowed to spring out an equal distance. Thus each land does its share of cutting and a smooth, true thread is the result.



Acorn Die Adapter

Other advantages are: Less wear, consequently smaller cost per die and less time spent in grinding and changing dies on the machine.

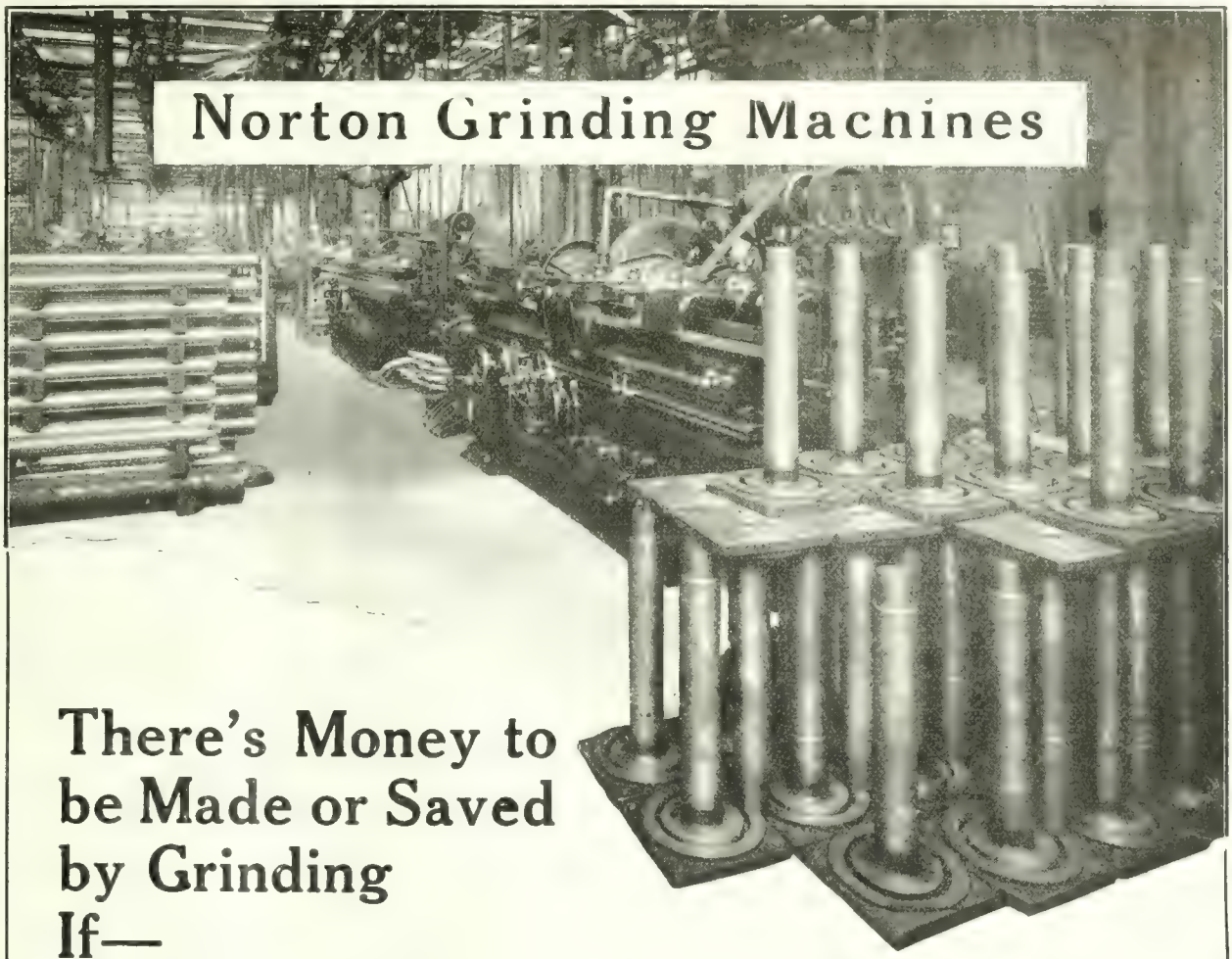
Investigate this die at once. Now! while it's on your mind. Send for illustrated booklet.



Parts of Regular Holder

Wells Bros. Co. of Canada, Ltd.
Galt, Ontario

SALES AGENTS: Canadian Fairbanks-Morse Company, Ltd., Montreal Toronto, Vancouver, Winnipeg, St. John, Calgary.



There's Money to be Made or Saved by Grinding If—

There is money to be made, or saved, by grinding nowadays if you will eliminate from your mind all your previous ideas of grinding and consider the subject from the modern point of view.

There are two classes of shop men who particularly need to "brush up" on present-day grinding practice.

One is the man who still persists in finishing his work in lathes. Roughing, finishing, filing and polishing—all in the lathe.

The other is the man who, while he makes his rough and finish cuts in a lathe, leaves only a little stock for finishing in his old-style grinding machine, considering grinding as little more than a polishing operation.

Both of these classes of men should realize that Norton Grinding methods eliminate entirely the finish cut in the lathe and, instead of being a polishing operation, grinding becomes the most rapid and accurate stock-removing operation now in use.

Shop photographs like the above, of which we have hundreds, show what is being done by Norton Grinding Machines.

Time, examples and other data gladly sent free to all.

Norton Grinding Co., Worcester, Mass.

CANADIAN SELLING AGENTS:

The Canadian Fairbanks-Morse Company, Limited

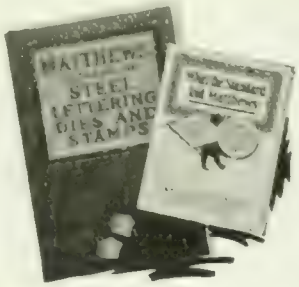
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

PROVE YOUR PRIDE IN YOUR PRODUCT

Mark it, and mark it clearly. You can do it with a Matthews die or stamp. We make them for marking all products. Our letters and figures are hand cut from the best tool steel.

Matthews stamps are extensively used for marking shells. Many Canadian munition plants have complete Matthews equipment, including holders, type, separate stamps, inspectors' hammers, etc.

Catalog gives complete description of our extensive line, send for a copy.



Special "Champion" holder with type chamber curved radially for marking base of shells.

Special "Champion" holders with type chamber curved on face for marking sides of shells.

JAS. H. MATTHEWS & COMPANY

ESTABLISHED 1850

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is only as strong as its weakest link, so a file can only be as good as the steel from which it is made.

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Quality Files

have over all other files made in Canada.

We will tell you others later.

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(23.)

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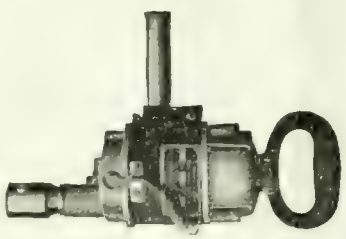
Save Time, Labor and Money



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For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES

3-16 in., W.G.T., 6 lbs.
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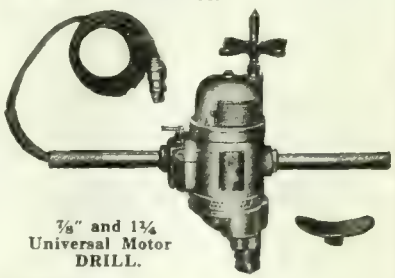
All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜" and 1¼ Universal Motor DRILL.

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THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

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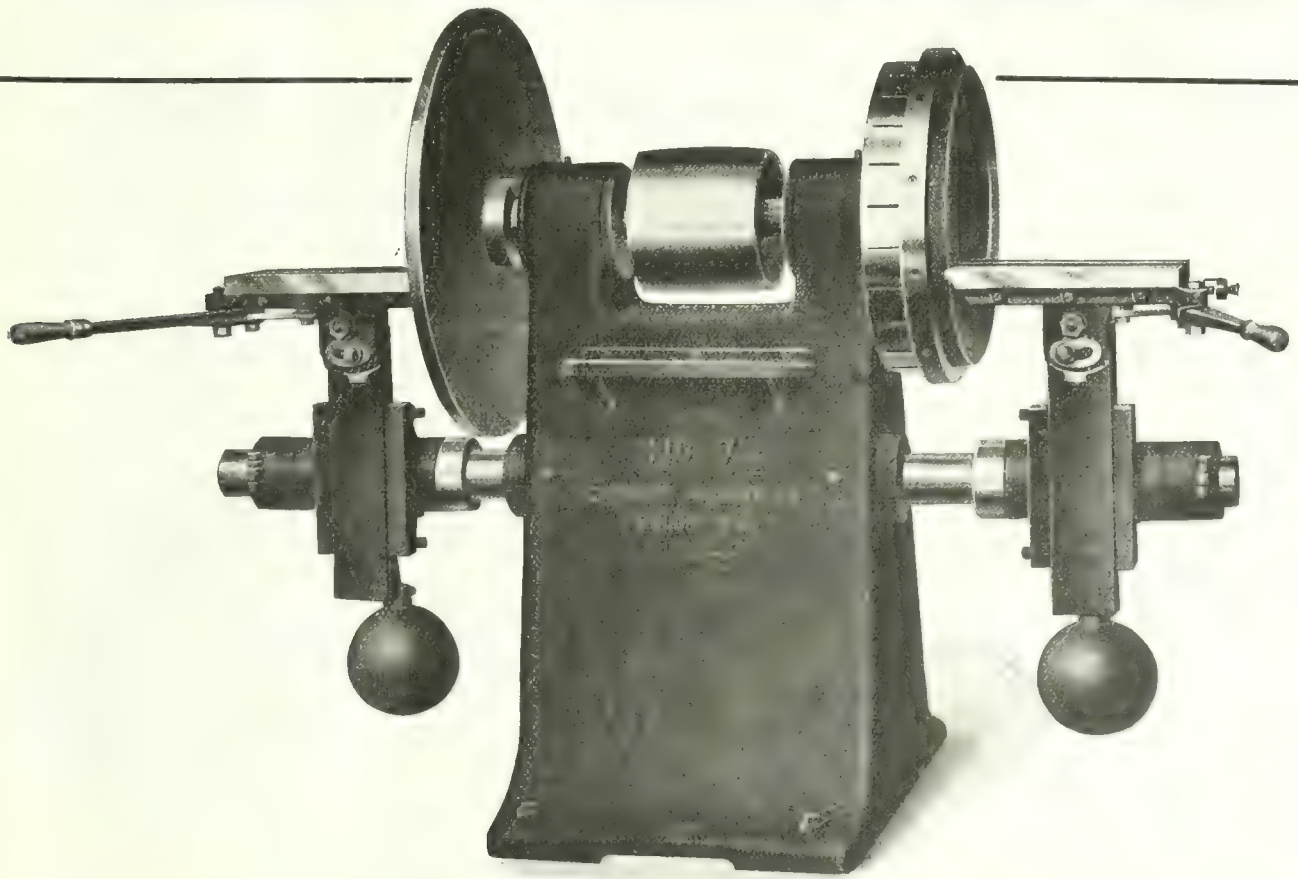

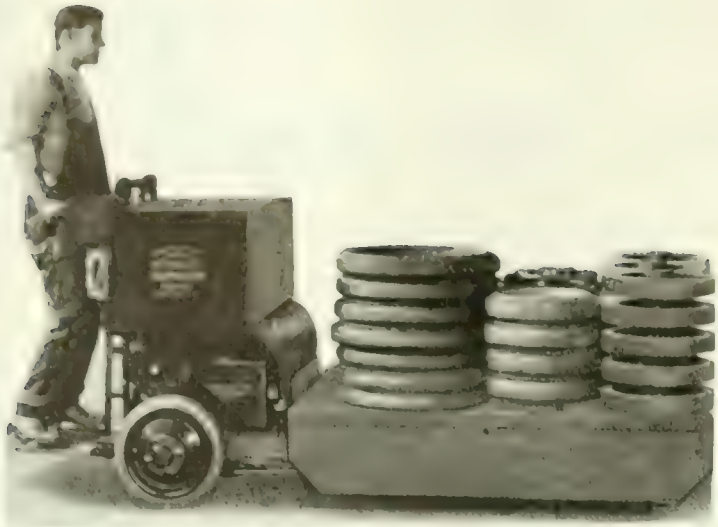

Type "I" Electric Elevating Truck. Capacity 4,000 lbs. Speed 4 m. p. h. Turns in 5 inches less than Platform 4' 7" by 4' 1"

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Some of your men will be taken for Military Service.

Labor-Saving Machinery will keep up your production.

Fewer men will be needed for handling of materials if you use

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Application of Electric Arc Welding to Machine Shop Uses

Staff Article

In all branches of industrial progress the initial steps in the commercial development of a particular art or science have always to be taken by a small minority of pioneers whose keenness of perception and breadth of vision have enabled them to grasp the salient facts at an early stage. The installation described in the following article is a recent example of progressive action which falls within the aforementioned category.

THE use of electricity, as a means of heating metals to the point of fusion thereby enabling different objects to be welded together, has been in existence for several years. The manufacture of welded tubes and the joining together of wire coils in wire-drawing plants were amongst the earlier applications of electric welding to manufacturing work. Such applications, however, were of a more or less specialized nature. In recent years considerable progress has been made in the development of equipment and methods of use, and now electric welding is recognized as a standard manufacturing process, capable of doing sound, reliable work in various metals. It can be utilized under all conditions and has been found to yield economical and efficient results in many widely varying fields of metal working activity.

Autogenous and Incandescent Welding

The term, "autogenous welding," frequently used in connection with blow pipe as well as with electric welding, refers definitely to the fusing together of two metals by the application of heat without pressure, while the union of two metals by means of blows or pressure while in a heated state is classed as incandescent welding. This latter class, therefore, includes butt welding and spot welding, in both of which the pieces to be united are pressed together more or less firmly, while arc welding, like blow pipe welding, relies entirely on the attainment of a temperature sufficiently high to melt the metals, so that they mix together in a liquid state and, when cool, form a thoroughly homogeneous junction.

Electric welding equipment of a type and capacity suited for use on the majority of jobs met with in modern machine shop practice has been installed recently in the plant of the Hamilton Gear & Machine Company, Toronto, and has already been the object of considerable attention from manufacturers in allied lines.

The principal use to which the process has been applied by this firm is the salvaging of high-speed steel and stellite from the scrap heap. The method employed is that of arc welding scrap bits of high-speed tool steel and stellite to shanks of cheap mild steel, thus producing useful cutting tools for lathe, planer, shaper, etc. That great savings can be effected by this system is perfectly apparent.

FIG. 1. GROUP OF MACHINE SHOP TOOLS WITH TOOL STEEL TIPS WELDED ON ELECTRICALLY.

The group of tools illustrated in Fig. 1 indicates the wide range of shapes possible in tools for lathe, shaper and planer work, while a special application is shown in Fig. 3, which is a profile tool for accurately forming the outline of the bevel gear blanks in the foreground. The width of cutting edge on the latter tool, combined with the large amount of overhang, produces a condition not at all conducive to the maintenance of the cutting edge, and the percentage of scrap involved after frequent grindings would be considerable. By using ordinary steel plate with a high-speed steel cutting edge of suitable proportion the cost of this tool is reduced to a fraction of what it would be if made completely of high-speed steel. The cutting edge may be renewed indefinitely and the reduced liability to fracture by vibration due to the use of the soft steel plate insures a desirable economy in upkeep.

The tools shown in Fig. 1 are of familiar types; and here again the economy of material and variety of shape obtainable are immediately apparent.

At the left is a round-nosed lathe tool ground and ready for use; next to it is a similar tool in the rough. The two flat forming tools in the foreground were four scrapped tools before welding. The two large tools in the centre and the two at the right are wide-faced tools of straight and side cutting design. In all of these the cutting edge is of high-speed tool steel selected from the scrap heap. The shanks are of cheap, mild steel.

FIG 2.—VIEW OF WELDING INSTALLATION, SHOWING CONTROL PANELS AND OPERATOR WORKING ON ARTICLES SHOWN IN FIG. 4.

Two Electric Methods

There are two methods of electric arc welding. One where a metal electrode

is used, and one where a carbon electrode is used.

Metal electrode welding requires a wire or rod of suitable material, which forms the positive terminal of the elec-

FLAT CUTTER WITH LONG WELDED TOOL STEEL EDGE FINISHING BEVEL GEAR BODIES IN TURRET LATHE.

tric circuit; the article being welded is made the positive terminal. The arc is formed by touching the work and quickly withdrawing the electrode to a distance of about 3/16 in. or less. The heat generated by the arc melts the metal at the point of application, and the electrode itself melts, furnishing the molten metal for joining or building up the welded parts.

With the carbon electrode system a carbon pencil or rod is used for the electrode, and is made the negative terminal as with the metal electrode. The heat which can be obtained with the carbon electrode is practically unlimited, and the metal can, therefore, be melted very rapidly. In welding with the carbon electrode the filling material must be supplied in the form of a separate rod or bar.

The question might be asked: Do not carbon particles enter the weld and cause a very hard quality of iron at the joint? The logical answer is yes, but if the carbon electrode is held far enough away from the weld, particles of carbon are not carried into it, and, with ordinary care, joints which are soft enough to be machined can always be made in steel. In cast iron it is much more difficult to produce a soft weld.

Relative Advantages

The relative merits and advantages of the two processes depend on the class of work to be done. The carbon arc for average work usually requires from 150 to 400 amperes, with a voltage of from 40 to 60. The current required with the metal electrode is approximately from 60 to 100 amperes, with a voltage of from 50 to 80. A resistance is used in series with the arc in each type to steady it. Obviously, of the two methods, the carbon would lend itself better to heavy cutting or applying large quantities of metal quickly and is the more frequently used in such classes of work. The comparatively slow rate of deposit by the metallic method makes for a smoother, more uniform and better-looking weld, and hence is used in lighter service, such as general repair work, etc. The temperature of the arc with the metallic electrode is considerably less than with the carbon, and with care the metal need hardly be raised above the melting point.

Although the current for welding may be taken from any direct current system, providing sufficient resistance be used to reduce the voltage to that required at the arc, it is economical to use a specially-designed low voltage generator, independently driven. This is the system employed at the plant described; the compound wound generator has a capacity of 300 amperes at 60 volts, and is wound for constant voltage.

The motor-generator set is mounted in a room separate from the welding station, which latter is shown in Fig. 2. The control equipment consists of a main generator panel, ammeter, volt melter, overload circuit breakers, field control switch, and rheostat, together with the welding circuit control apparatus. This consists of an automatic switch with its relay, and a hand-operated rheostat switch in series with each welding circuit. The small panel nearest the observer in Fig. 2 controls an auxiliary welding circuit, so that two operators can be supplied with current from the one generator at the same time. Once the series resistance is set no further adjustment is needed by the operator, but, should the current become excessive, the series relay permits the magnetic contactor to drop open and break the circuit. When the arc is thus broken the circuit is automatically restored by the relay, so that the arc can be drawn afresh by the operator for a new start.

Additional Applications

Besides the uses mentioned, there are many other industrial applications where electric welding may be used to advantage. Fig. 4 shows how broken castings may be repaired by welding on new metal. The pieces shown are the backs of scroll chucks put out of commission by the breakage of small lugs which had worn thin. Welding restored these at a cost of a few cents. Often it is possible to reclaim castings, where large blowholes are found in the course of machining, by filling up the hole without removing the casting from the machine.

Another application which has proved satisfactory in foundries and steel works is the opening of tap holes and tuyeres in furnaces. The furnace is made the positive terminal of the circuit, and the negative is a solid carbon rod, 2 inches in diameter and 4 ft. long, fitted into one end of a wrought-iron pipe, which is provided with a wooden handle at the other end. But perhaps its largest field has been in railroad and marine repair work. Repairs on boilers are made quickly and with no tendency to develop strains in cooling, because the heating is almost entirely localized, thus practically avoiding such strains after the weld is completed.

The cost of an electric welding outfit such as described is many times that of an oxy-acetylene or other system; but for such work as it is best adapted to it can be operated at from one-half to one-fifth that of any other known welding method. The plant of the Hamilton Gear & Machine Company is the first of its kind to be installed in Toronto for general commercial work.

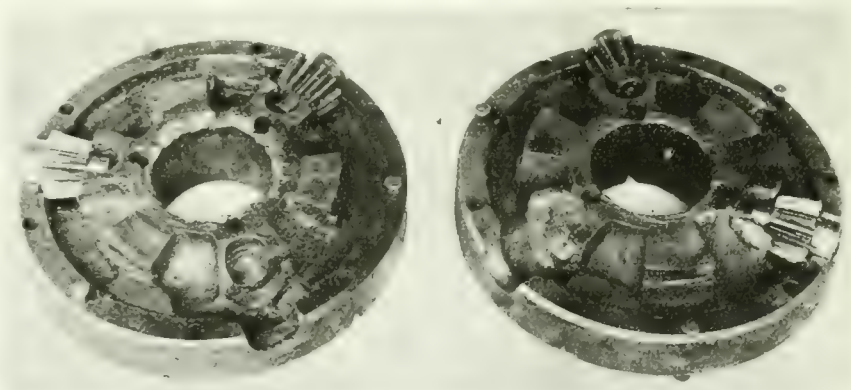


FIG. 4.—CHUCK BODY WITH BROKEN WALLS ON PINION SOCKETS. LEFT, DAMAGED BODY. RIGHT, BUILT UP ELECTRICALLY, SAVING LOSS OF ARTICLE.

Montreal, Que.—The Canada Cement Co., it is understood, contemplates installing a plant for producing potash as a by-product of the cement industry.

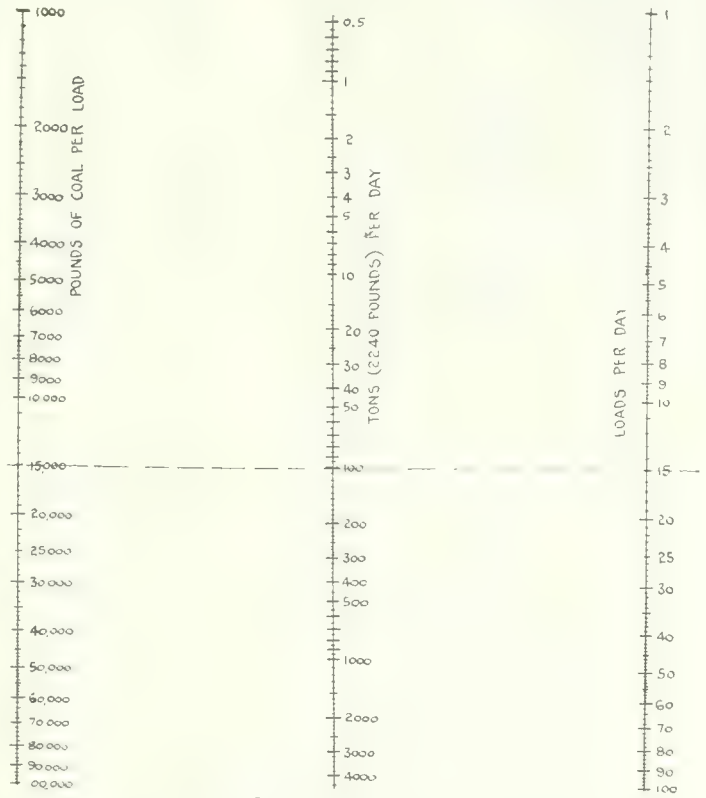
A HANDY LOAD COMPUTING CHART

By N. G. Near.

THE accompanying chart will be found useful in making load computations. You don't have to use a pencil at all, nor do you have to work it out mentally. Just stretch a thread or string across from known point to known point and the problems solved.

For example, if you have a truck that will carry 15,000 pounds, and the truck can haul 15 loads per day, how many tons (of 2,240 pounds) will it haul per day? The dotted line drawn across the chart shows in the middle column that the truck will carry 100 tons per day.

The chart can be used in various ways. If, again, you want to carry 100 tons per day, and your truck will hold 15,000 pounds, the same straight line will show you that you will have to make at least 15 trips per day to haul that much.



HANDY LOAD COMPUTING CHART.

It will be noted that the range of the chart is very wide. It can be used in connection with carload lots as well as with wagon or truck load lots.

PERSEVERANCE AND HABIT

A LOCOMOTIVE starting a long train of freight cars is a familiar sight, and the first thought that it suggests is that a vast amount of energy is being expended in proportion to the results. The driving wheels, losing their grip on the rails, whirl round at high speed, and deafening noises come from the exhaust pipe and from clanking side-bars and couplings, creaking wheels, and other sources. These evidences of wasted energy continue for only a short time, however. The engineer sands the rails, the driving wheels "bite," and the train gets away; and unless engine troubles develop, or steep grades are encountered, the locomotive has little difficulty in keeping the train moving after the first inertia has been overcome.

There is a striking similarity between this and accident-prevention work. We are all creatures of habit, and history shows that bad habits are easily formed and hard to break, while good ones are often hard to achieve and easy to break. This fact has a decided bearing on accident prevention. It is generally agreed among men engaged in safety work that in making a shop safe, mechanical safeguards, while important, do not have as great an influence as careful workmen. "Careful workmen" are men who have given serious thought to the proper and safe way of doing their work, and have consequently formed the habit of being careful at all times. There may have been temptations to take chances, but perseverance in doing the right thing soon developed the safety habit; and—here is where the example of the locomotive and the freight train comes in—once the habit became well started, the man found it easier to keep on than to stop.

On the other hand, a man who is given to taking chances, and has thus far escaped injury, will either fail to see the logic of exercising care, or else, perceiving the wisdom of carefulness, will find the chance-taking habit so ingrained in him that being careful at all times is next to impossible. Each time he knowingly takes a chance and escapes injury his determination to be careful will be weakened. A man who will avoid standing or passing under a crane load, and five minutes later will creep between railway cars rather than walk around them, cannot be considered a careful man. It cost him little effort and perhaps no loss of time to avoid the crane load, but walking around the freight cars might take a couple of minutes. He preferred the short cut between the cars, with the attendant chance of inquiry, rather than the assured safety gained by walking around the train. This man is inconsistent, and yet he is typical of thousands of workmen, who either fail to start right or fail to keep going after they have set their feet in the safe path.

Accident prevention resolves itself into a continuous, competently-directed campaign to inculcate the habit and thought of carefulness in the workmen. The head of a plant must not falter in rendering moral and material assistance while starting and continuing such work. A lack of interest on his part, or on the part of his immediate subordinates, will have the same effect on accident-prevention work that shutting off the steam from the locomotive will have on the freight train. Steady, forward progress is supplanted by the slackening motion due to mere inertia, the energy expended in starting the freight train or the safety habit is largely wasted, and an equal amount of energy must be expended to get the work going again.

Neither the freight train nor the safety habit is automatic or self-sustaining. There must be a constant supply of fuel,—coal in the case of the locomotive, and supervision and direction in the case of the safety work. There are many difficulties to be overcome, chief among them being proving, to the full satisfaction of the workmen, the folly of careless ways, and arousing their unwavering faith in the benefits of caution. But persistence and perservance along these lines will gradually develop careful methods among the men, and lead them to substitute careful habits for chance-taking or careless ones. Those addicted to the chance-taking habit are sure to be injured some time, while the men of careful habits are reasonably certain of freedom from injury.—The Travelers Standard.

AN UNUSUAL ACCIDENT

By A. L. Loy.

THE plant manufacturing the four-wheel-drive tractor shown in the accompanying photo was located quite close to a medium-sized river, which was in the habit of overflowing its banks quite often, and when this occurred it was necessary to move everything possible to a safe distance. In one instance the river came up rather suddenly and it was necessary to run to a safe distance quite a number of these tractors.

The tractor at the right had been run safely up on the side of a small hill and left there, while the operator went for another. In backing up the second tractor, he either became confused, as might be expected in such a case, or else failed to see it entirely. In either case the tractor was coming at full speed, and when the rear driver struck the stationary tractor it simply climbed right up the front end, and when stopped the wheel and, consequently, the greater portion of the weight of that end, was hanging on a five-eighths inch nut on the front end of the frame.

When the collision occurred the operator had presence of mind enough to pull out the clutch before he was thrown off the outfit to the one side. The first tractor was uninjured in any way, although the lugs on the wheel were within a frac-

TYPICAL RESULT OF COLLISION BETWEEN TWO TRACTORS

[illegible] of the radiator. Practically the only damage done to the moving machine was the breaking of a ball-and-socket joint over the front axle. The machines steered from both axles as well as having the power applied to all four wheels. The state of the ground through which the tractors had been moved may be judged from the condition of the wheels.

THE FIRST HEINE BOILER

AFTER a fire which destroyed the National Guard Armory in St. Louis, Mo., a few months ago, the Heine Safety Boiler Co., of that city, obtained possession of the first Heine boiler ever built, which was installed at the armory in 1881. It has 24 tubes about 10 ft. long; the heating surface is approximately 250 sq. ft., making the rating of the unit 25 h.p. The boiler was built in the shop of Richard Garstang, St. Louis. The original pressure for which it was designed was about 100 lbs. and an inspection certificate from the Fidelity & Casualty Co. has been received to the effect that they will certify this boiler to carry 80 lbs. pressure at the present time.

This indicates a somewhat longer life for water-tube boilers than is usually credited them by accountants or engineers when apportioning depreciation charges. However, under modern conditions the heavier loads on boilers would perhaps tend to lessen their life as compared to this little boiler. One odd feature is the casting which forms both the steam outlet and the water column. Another obsolete feature of this boiler is the vertical baffling which was discarded in later designs for the horizontal baffling, now the standard with Heine boilers of both the land and marine types.

GAS VERSUS STEAM POWER

THE gas engineer changes coal into coke, gas, etc., which afterwards produce heat by combustion. The heat produced by their combustion may be taken as 75 per cent. of the original heat in the coal, but for this efficiency no power whatever is produced. The gas engineer has only changed one source of heat for another source of heat. On the other hand, the steam engineer produces power from the coal; that is, he changes heat into work which is quite a different proposition from merely changing one source of heat into another source of heat.

When the gas engineer has also turned his heat into work he will find that only about 20 per cent. of the heat in the coal has been turned into useful work. The comparison therefore is that a gas engineer producing power from coal will convert about 20 per cent. of the heat of the coal into useful work in a good gas engine, whereas a small steam engine will convert 7½ per cent. of the heat into useful work. Large modern steam turbines are now converting from 16 to 20 per cent. of the heat in the coal into useful work, and thus compare very favorably with gas engines. In addition, steam turbines have been built in single units up to 50,000 kilowatts, are cheaper in first cost and in cost of maintenance, being thus in general more suitable for central power plants.—J. W. Kershaw.

PLATINUM fuses at 3,225 deg. F.; nickel at 2,642 deg.; copper at 1,931 deg.; aluminum at 1,160 deg.; lead at 850 deg.; zinc at 812 deg.; antimony at 808 deg., and tin at 551 deg.

TARNISH on electro-plated goods can be removed by dipping for 1 to 15 minutes until the tarnish is removed in a pickle of rain water 2 gallons, potassium cyanide ½ pound. After dipping, rinse thoroughly in several waters and dry in fine clean sawdust.

A CHEAP mixture for making hard white iron for pipes consists of white iron scrap, such as burned grate bars, with a slight addition of car wheels. Additions of wrought scrap to reduce the silicon low enough to make the castings white also is advisable. The addition of a small amount of pure aluminum in the ladle will remove the gas and will make the iron fluid enough to produce sound castings.

THE manner in which latent possibilities of production have been stimulated by the war is exemplified by the Baldwin Locomotive Works which two years ago was turning out 30 locomotives a month. Recently the output mounted to 9 completed locomotives per day for a week, and is expected to reach 225 per month soon.

A BRONZE that will resist the corrosive action of mine water is made of copper 90 per cent. and tin 10 per cent. The castings must be sound, dense and free from oxides of copper and tin.

Another mixture for the same purpose consists of copper 86 per cent., tin 8 per cent., zinc 5 per cent., and lead 1 per cent.

EXPERIMENTS made in Germany since the war began have shown that it is possible to convert alloys of zinc and iron into quite uniform metals, suitable for casting, by stirring into the molten iron-zinc alloys from 8 to 10 per cent. or more of either manganese free from carbon or of a high percentage ferro-manganese in the molten state, and that it is generally possible in this manner to effect the complete absorption of the manganese by the alloy in a single operation.

When molten ferro-manganese is employed, little or no carbon will be separated out, and both the manganese carbides and the metallic manganese will be dissolved in the other metals forming the alloys, the influence exerted by the carbides being limited to the fact that their presence imparts a greater degree of hardness to the resulting metallic alloys than would be the case were manganese free from carbon employed.

ACCORDING to The Army and Navy Gazette the Gotha biplanes exhibit a marked resemblance in certain particulars to one of our best-known large aeroplanes. They are about 40 ft. in length and of the "pusher" type. The wings are nearly equal in span (about 77 ft.), with projecting ailerons, and are at a very slight dihedral angle. TThe gunners, both front and rear, can fire downwards and upwards, as well as on their own level or right and left, and the bottom of the fusilage is open for a great portion of its length, which enables the gunner to fire at a pursuer either over the top of the fusilage or through the tunnel formed by the fusilage, and both gunners can also fire downward through trap doors. The aeroplane carries a crew of three; the armament consists of three machine guns. It cannot be approached from any direction without the adversary coming under the fire of one or other of its three guns. In fact, the adversary who comes at the aeroplane from the rear is likely to meet the concentrated fire of two machine guns. The first gunner sits nearly in the centre line of the machine, but the pilot is placed on the left, there being thus a passage on the right which enables the gunner in front to move to the back and work the second of the two guns in the rear.

Press Work Operations in Hospital Equipment Production IV.

By D. A. Hampson

Operations possessing marked features of economy, adaptability and lack of intricacy in the finished product are characteristic of the work described. The factors of labor cost, quantity production, necessary degree of accuracy, and cost of dies are related to each other in a manner which must receive careful consideration if successful results are to be obtained.

AN observer will have noticed that iron bedsteads are made with the rods that go to make up the ornamental heads and feet set in cast iron rings or blocks according to the particular design. These rods are laid in the moulds and the iron run around them securing all in one piece: the practice generally followed is to have a loop or hair pin turn of the rod come within the mould—in other words, where we see two rods entering the cast piece from different directions, it is in reality the same rod and the bend is concealed by the mass of cast iron. Such a construction is separable only by actual breakage.

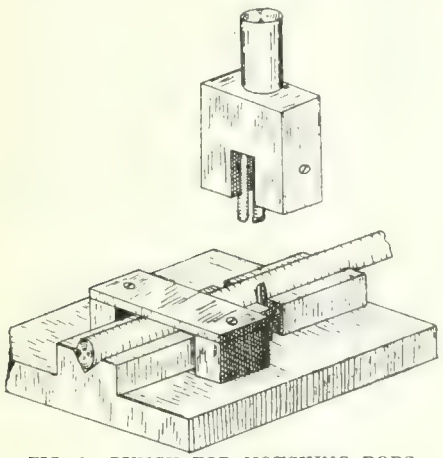


FIG. 1. PUNCH FOR NOTCHING RODS.

Notching Rods

There are cases, however, where a rod ends with the mould and then it is customary to make some sort of a rough bend to insure the rod's never pulling out. In the case of an officer's cot of knock-down construction recently perfected, the side rails were dispensed with and in their place a sort of truss constructed of two ⅜ in. iron rods which in the setting up were drawn taut with a cast iron turn buckle, the other end of the rods being set in cast pieces. Of course, this put considerable strain on the rod end and instead of bending, the quicker expedient was adopted of cutting two notches across the rod.

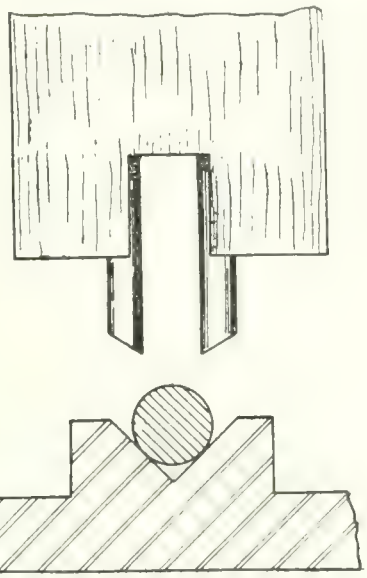


FIG. 2. END VIEW OF FIG. 1.

The notching scheme was an adaptation of one long in use for an entirely different purpose and is shown by the drawing Fig. 1. A punch with two cutting ends is employed and they take a piece from each side of the rod at the same time, the cut is perfectly balanced and there is no tendency to turn. It will be observed that the puches are well backed up—this makes breakage very little and consequently the upkeep is slight. The work, naturally, is done in the shortest space of time that any method could consume.

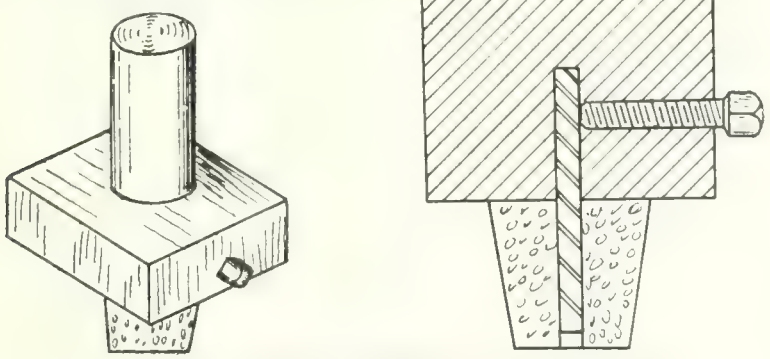


FIG. 3. PUNCH STRIPPER MADE FROM AN ORDINARY CORK.

There are very few punch and die jobs that do not require some sort of a stripper to pull the sheet or blank off the punch. In this shop the simplest stripper the writer has ever seen was employed. It was nothing but a cork slipped over the punch, as illustrated in Fig. 2, and it was used on all punches up to ⅜ in., punching holes in light sheet metal.

A form of clip used as a field assembly piece has already been illustrated with the tools for bending. Another one is shown in Fig. 3(C). This is made from the heaviest gauge of sheet tin and is designed to join several pieces when finally clinched over with a hammer. The size and shape of the piece are shown. A neater job would have been turned out if the piece had been blanked first and formed by a second operation or the work done on a double action press. But the only machine available was an old single action press and the work was not particular—not as particular as keeping the tool cost down. The sectional die and the punch are detailed in the drawings Fig. 4(A) and (B).

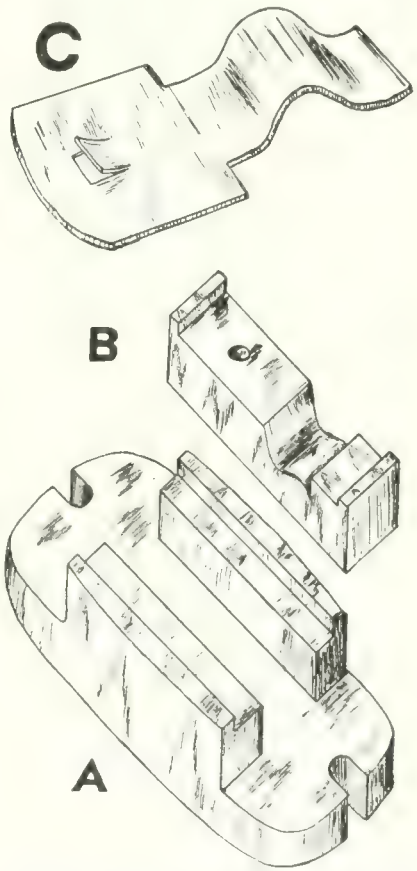


FIG. 4. DETAILS OF STAMPING AND DIE PARTS FOR SAME.

Sectional Die

As the stock was tin, the forming mem-

ber of the die was made of soft steel and left soft. The latter part of the die was built up of tool steel strips as being cheaper than the cut-out form and having

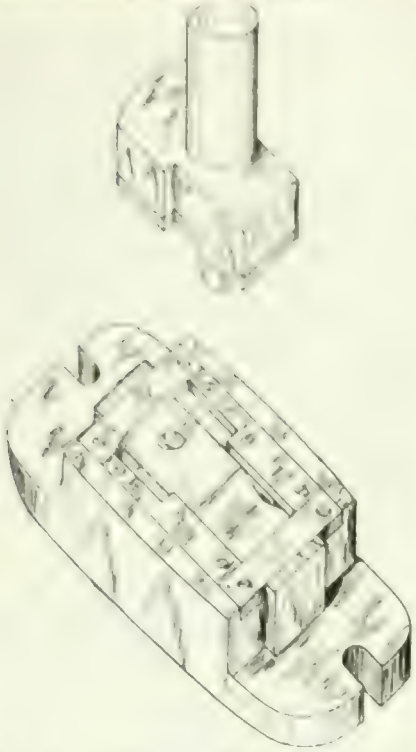


FIG. 3. ASSEMBLED DIE WITH FORMING PUNCH FOR 3C

the advantage of a limited adjustment (punch and die were fitted closely for this thin stock and this was the only set in the plant so made). Inserted pieces formed the little tab near one end. The guides and stop are omitted for the sake of clearness. As one familiar with such work may imagine, there was a certain amount of pucker on the finished piece due to the forming commencing before the blank was cut free from the sheet, but on this job it was of no importance and the production and its cost were considered very satisfactory.

WELDING EQUIPMENT AT PANAMA

THE following description of welding plant and methods, published in a recent number of the *Canal Record*, indicates the completeness of detail with which this great undertaking is operated. It will be noted that oxy-acetylene, oxy-hydrogen, and electricity are all utilized.

The acetylene generating and compressing plant consists of two Navy-type acetylene generators, each having a capacity of 200 pounds of calcium carbide at a single filling and generating 200 cubic feet of acetylene gas per hour. This outfit includes a 100-cubic foot gasometer, a purifying and drying apparatus, Chatillon and Osgood weight scales, and an acetone charging apparatus, a gas meter, a 3-stage compressor, and a tank charging rack, with especially prepared cylinders to contain compressed acetylene gas.

The special acetylene cylinders are used for supplying gas for coast and range lights for the Marine Division, the Republic of Panama, Nicaragua, and Costa Rica. There also are acetylene gas cylinders used for welding and cutting purposes at Balboa, Cristobal, Paraiso, and other points along the Canal Zone. This plant supplies also gas for tanks for lighting purposes on automobiles and motorcycles.

There are about 18,000 pounds of residue per month which is a by-product in the manufacture of acetylene gas. It is turned over to the Balboa storehouse and is used for fertilizer and whitewashing purposes on the Canal Zone.

Acetylene gas manufactured in this plant during the year ending June 30, 1917, amounted to 606,649 cubic feet.

The oxygen and oxy-hydrogen generating and compressing plant consists of a 50-horsepower motor-generator set, a 30-horsepower motor-generator set, 45 electrolytic cells, two gas meters, a 100-cubic foot oxygen gasometer, a 100-cubic foot hydrogen gasometer, a gas testing apparatus, a gasoline apparatus, three retorts, three scrubbers, a water distilling outfit, hydrogen compressor, two oxygen compressors, with cylinders to contain compressed oxygen and compressed hydrogen.

Oxygen is the combustion agent used in oxy-acetylene and oxy-hydrogen welding and cutting. It is used also by the chemical laboratory and Ancon Hospital for medical purposes. It is manufactured in building No. 16, Balboa Shops, by two methods—the electrolysis of water process and the chemical process.

The electrolytic method of manufacturing oxygen and hydrogen is by decomposing water to which caustic soda has been added. The operation is carried out by means of electricity, the water being divided into its elements (H_2O) and the two gases collected separately and conveyed to gasometers. The electrolytic outfit is running 24 hours per day, producing about 4,000 cubic feet of oxygen and 8,000 cubic feet of hydrogen per day.

The chemical process of manufacturing oxygen is by mixing potassium chlorate with about one-eighth of its weight of manganese dioxide. This is put into air-tight retorts and heated by a gasoline apparatus until the oxygen is driven out and into the oxygen gasometer; the residue remaining in the retorts is taken out and shipped to the United States, where it is sold. If necessary 4,500 cubic feet of oxygen can be produced in 24 hours by the chemical process, but on account of its being much more expensive than the electrolytic process the chemical method is used only when enough oxygen can not be secured by the electrolytic method to carry on the work. Oxygen manufactured at this plant during the year ending June 30, 1917, amounted to 1,099,378 cubic feet.

The oxy-acetylene process is used in cutting and welding work in general, such as cutting steel and wrought iron plates, rivets, cutting out rivet holes, cutting ov lengths; to mitre or bevel any section of steamships, barges, dredges, dipper sticks, spuds, buckets, impellers, and iron and steel scrap; welding cast iron, steel, aluminum, brass, copper, and malleable iron, as in welding together broken ship machinery, foundry castings, cracked cylinders, propellers, dredge buckets, spuds, dippers, pipe, and shop machinery.

Oxy-hydrogen is also used at Balboa Shops for cutting, but not as extensively as the oxy-acetylene process. Oxygen removes carbon from gas engine cylinders in a few minutes and more effectively than any other method.

Electric arc welding outfits used by the Mechanical Division are portable machines, one being stationed at Balboa Shops and one at Christobal Shops. The equipment used for this line of work is especially suitable for marine and locomotive boiler work, heavy steel castings, plate work, patches, and heavy frame work.

In oxy-acetylene and electric welding, each has its special advantages and in cases in which either process can do the work the point of quality and economy decides the method. The great saving of time and labor is seen when it is stated that it would require 4 men with pneumatic air tools to cut off as many rivet heads on ships, dredge buckets, or spuds as one oxy-acetylene cutter could do in the same length of time. Broken parts may be welded together in a few hours that would require days to have made at a foundry or weeks if parts had to be ordered from the United States. Repairs can be made by the electric welding process on steamships and locomotive boilers in a day that would require five or six days by other methods.

AEROPLANE LIMITS

IT is a commonplace of bridge engineering that there is a fixed limit to the length of span possible with a given type, since the weight of the structure goes up rapidly as the span is increased, and at some limit of span becomes so large that the bridge would break down under its own deadweight acting alone, even without the added burden of the traffic to be accommodated. The limiting useful span is that at which the stresses due to the weight of the structure plus that of the traffic reach the safe limit, and an increase of span beyond this is impracticable without a change either in the type of bridge or in the materials with which it is made. The supporting surfaces of an aeroplane are subject to the same law—that their weight increases with increase of dimensions more rapidly than their strength does, and this would in itself suffice to fix a limit to the possible size of aeroplanes. Matters are, however, still worse when allowance is made for the fact that level flight is impossible without engine power, and hence, before the wings can carry any useful load whatever they must be able to support not only their own weight and that of their essential structural elements and connections, but also that of the engine. It is thus only the balance of sustentation left after deduction for these that is available for supporting the useful load, which will include the weight of the crew and of all other weights which are not in the shape of fixtures or engine supplies.—*Engineering.*

Principles and Methods of a New System of Gas Firing*

By A. C. Ionides

The researches of the author into combustion processes have yielded many valuable facts and the inception and development of the furnace described by him are particularly interesting. Not only the simplicity and ingenuity of the finished apparatus, but the economy of results obtained indicate the desirability of full development being accorded it.

THE author's method of heating with gaseous fuel dates from June, 1909, when he was carrying out an experiment preliminary to constructing a calorimeter for testing the calorific value of petrol air-gas. The experiment was to ascertain whether or not the flues could be downwardly displaced in a calorimeter, in order to avoid any possible loss of heat.

At that time silica glass was a new material, and it so happened that a little prior to this date this material was exhibited for the first time at the Royal Institution. A test tube, about ½ in. inside diameter and 6 in. long, and a piece of 1-16 in. bore silica glass tube about 8 in.

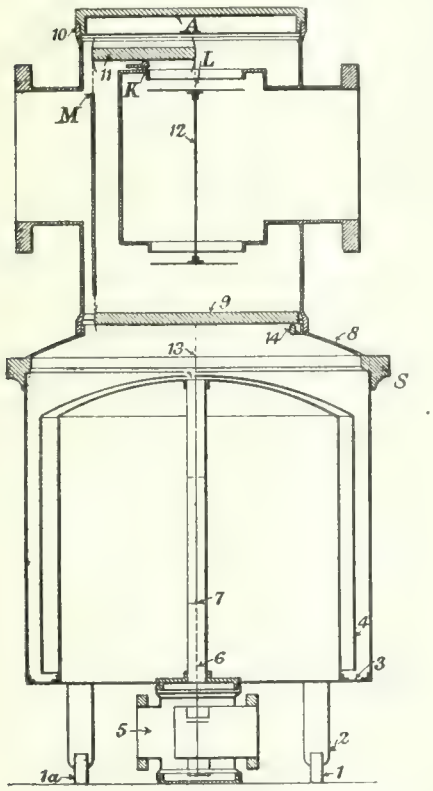


FIG. 1.—MIXING BALANCE. 1, 1a, levelling screws; 2, feet; 3, bell container; 4, sensitive bell; 5, gas-valve box; 6, gas connection to bell; 7, bell-rod guide; 8, cover to container; 9, main beam; 10, cover to air-valve box; 11, secondary beam; 12, double-beat air valve; 13, chain attachment to beam; 14, fulcrum for main beam.

long were acquired. Connecting one end of the silica-glass tube to the petrol air-gas by means of rubber tubing, the author ignited the mixture, and was astonished to find that it burnt, and continued to burn, in the upper end of the inverted test tube. Moreover, as the silica glass became hot, the flame either disappeared or became invisible, and the character of the combustion altered. The changed state of combustion continued indefinitely, and suggested that there should be no difficulty in transmitting the greater part of the heat units of the gas to the object to be heated. This experiment may be said to have established the fact that flues may with advantage be downwardly displaced.

The first problem that presented itself in applying this new principle was the difficulty of establishing and maintaining a constant mixture. There are three main variables to be dealt with as regards mixture: (1) The inlet pressure of the air; (2) the inlet pressure of the gas; (3) the variation in consumption of either air or gas that may occur in any given installation.

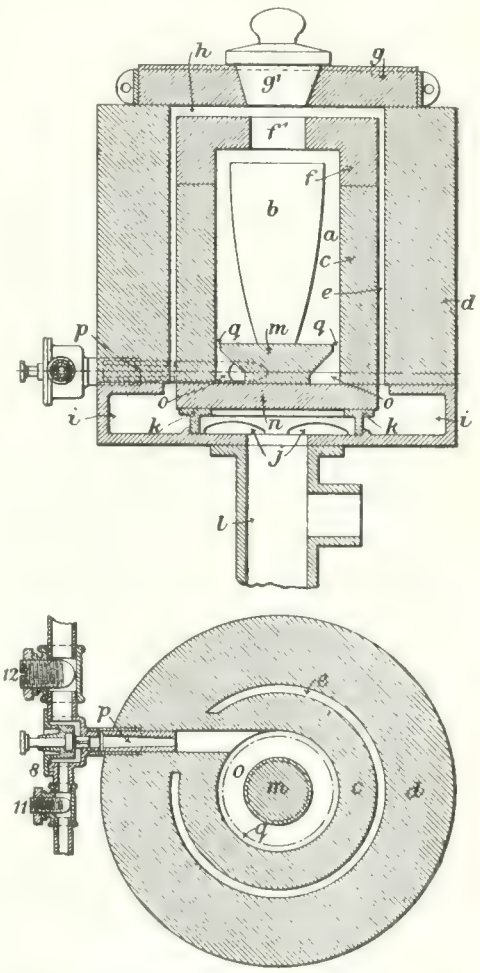
Control Device for Pressure

This first problem was most difficult of all to solve, since, for domestic purposes, etc., it was necessary to deal with differences of pressure sometimes involving a consumption of, say, 2.7 cub. ft. of gas per hour. Nevertheless, after a lapse of four years, this problem was solved by the construction of a device now known as a pressure balance.

It has been suggested that a better name would be a "mixing balance," and the author concurs in this view. This balance (Fig. 1) consists of a sensitive bell 4, with a requisite length of seal. The inside of this bell is subjected to the static pressure of the gas, and the outside to the static pressure of the air. It will be seen from the figure that when the static pressure of the gas increases, the arrangement is such that the flow of gas cuts itself off, and the flow of air is, to some extent increased; and likewise, when the static pressure of the air above increases it shuts itself off, and opens the gas correspondingly, and *vice versa* when the gas and air are decreased. And, it is to be observed, a similar cycle of operations takes place when the consumption of the one or the other is increased or decreased. Therefore, by such a device the pressures of gas and air are always held in a constant ratio, whatever be the variation of either the inlet pressure of gas or air, or the consumption.

If a mixture of gas and air be rich in gas, the flame is correspondingly lengthened. On the other hand, if the proportions approach 6 or 7 volumes of air to 1 of gas (according to the quality of the gas), it is quite possible, given silica or any other good catalyzer, to have no flame at all, but merely surface combustion. Now these conditions present great difficulties in heating with a neutral mixture —one which may be said to be neither oxidizing nor reducing—because of the tendency to local heating; and before this was finally and satisfactorily solved another three years had passed.

Should a good catalyzer be placed at right angles to a stream of well-proportioned mixture, a glowing disc will be observed. On the other hand, if all catalyzers in front of this stream are avoided, the combustion can be spread out to a very considerable length. The author has proved by experience that with a ¾-in. injector, or even with one of ½ in., it can be spread out to a length of 3 ft. of almost homogeneous combustion, by putting the injector into a channel of firebrick opened at the top, as in Fig. 2. In this way the heat units can be distributed in a furnace,



FIGS. 2 AND 3. CRUCIBLE FURNACE. A, furnace chamber for containing a crucible, b, crucible; c, inner walls; d, outer jacket; e, flue space in between outer and inner jacket; f, collar with central aperture f1; g, cover with movable plug g1, resting on outer jacket d; h, space between f and g forming a communication through the aperture f1, so that the combusting gases vent themselves downwards through the annular space e, and pass thence through the hollow platform i, by way of the aperture j in the central supporting ring k, to the downward discharge pipe l.

*Paper read before the Institute of Metals, London, September, 1917.

or boiler, or any other heating apparatus, in a very satisfactory manner.

Effect of Temperature Increase

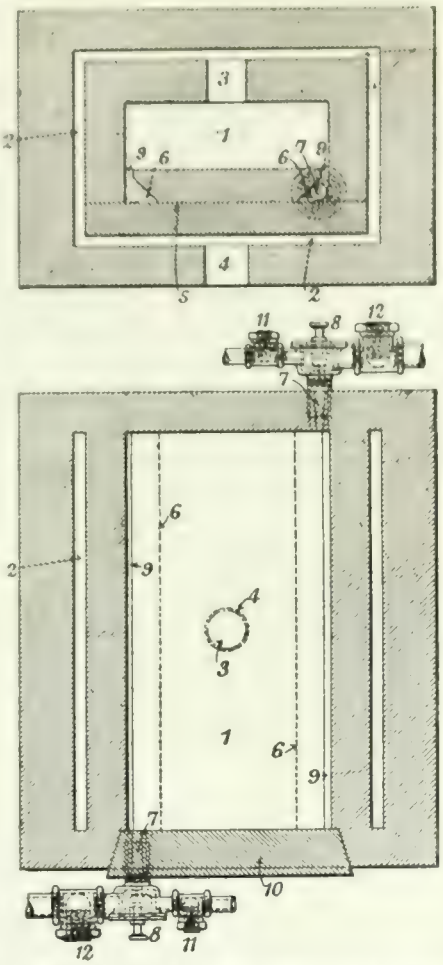
The third point in the system under discussion resulted from an observation that the hotter the furnace grew the less was the consumption of gas. By taking into consideration the expansion of gases by combustion, some light is thrown on this phenomenon. What happens if the mixture enter the furnace at, say, normal temperature, 15 deg. C.? Obviously, if it act as a perfect gas, it will have expanded [illegible], or 5½ times its original volume.

If the waste gases, instead of passing into a chimney open at the top, are displaced forcibly through a contracted exit of predetermined cross-sectional area, this will cause a resistance to the flow of incoming gases and provide the elements of the most refined thermostat, without any working parts. In fact, by these means the temperature to be maintained can be predetermined with a pencil and a piece of paper.

The fourth problem was how to determine the mixture. After many trials it would seem that the simplest plan is to fit an ordinary gas cock with a piece of copper tubing bent with an easy bend and enlarged at the farther end, and screwed into the injector in such a manner that the enlarged opening at the end of the copper tubing faces the central axis of the delivery pipe, in this way avoiding stream lines. Now, if a piece of india-rubber tubing and an incandescent mantle be fed with this mixture, the light will indicate the character of the mixture. If the meshes of the mantle are visible, it means an oxidizing mixture. If, however, the mantle is at its most brilliant point, the mixture will be very near the neutral point. On the other hand, if any unburnt gas is seen to escape from the mantle in the shape of a blue flame, the mixture will be an excessively reducing one. There is a further variable to which reference has not yet been made, and that is the quality of the gas. This can be provided for by external distribution. Let it be assumed that there is a mixing balance on the air and gas mains entering into a factory, and that all the injectors in the factory are properly calibrated and set for their various functions—brass-melting, steel-heating, illuminating, etc. When an unwelcome change in the quality of the gas occurs it is immediately visible on one of the lights. A regulating cock on the air main (preferably a screw-down tap) will at once put this right, and the whole of the factory will be compensated for this change in the quality of the gas.

Advantages of Employing These Principles

From what has already been said, it will be readily seen that the conditions of conducting heat operations of many kinds on these principles are cleanly, and extremely economical in fuel. But the economy is not only in fuel, but also in forgings. There is specially notable the facility with which a reducing or an oxidizing flame can be established and maintained, thus ensuring a consequent absence of scaling. Manufacturers have informed the author that they often have to scrap as much as 90 per cent of their steel forgings owing to scaling. The figures given by perhaps the largest users of furnaces for steel forging in Europe,



FIGS. 4 AND 5. RECTANGULAR BARREL FURNACE. A heating chamber 1, having a door 10 at the front, is provided above and below, and, upon the greater portion of its sides, with jacketing flue spaces 2. The chamber 1 communicates by one or two central apertures 3 with the top flue space, and the heating elements passing through the said apertures pass downwards through the flues 2, and are finally discharged through the outlet pipe 4. In the bricks 5, forming the floor, there is provided along each of the two long sides a narrow combustion chamber 6, into which a nozzle 7 delivers mixture from a mixing device 8, provided with gas and air-adjusting means, 11 and 12. The long combustion chambers 6 each deliver the products of combustion by a long narrow slot 9 into the furnace chamber 1. The nozzle is positioned at one end of the long combustion chamber, so that the heating elements, due to their travel along the chamber and their upward motion to escape through the slot 9, enter the furnace chamber 1 with a diagonal movement parallel to the wall thereof. The gases passing along the wall will tend to turn at the angle when meeting the adjacent wall, and thus a whirling motion of the gases round the walls of the chamber will be created. If the nozzles for the two combustion chambers are arranged at opposite ends of the furnace, as shown, this whirling will be accentuated, the gases being gradually drawn inward across the roof of the furnace chamber on their way to escape at the outlet aperture 3.

after testing, for five months, a furnace for forging machine-gun barrels, were:—

Saving, 50 per cent. to 55 per cent.

Scaling, negligible.

Therefore, it is perhaps unnecessary to state that, even if there were no economy in fuel, there would still be a great saving with regard to steel forgings. A half-ton billet heating furnace has been made, and the figures given with respect thereto were:

Gas consumption, 1.3 cub. ft. per pound for full forging heat.

Scaling, negligible.

In Table I. is given a list of figures relating to 70:30 brass, melted in a 20-lb. crucible furnace. These figures speak for themselves, and show that in brass-melting an economy analogous to that afforded in steel forging can be effected. It might be added that Messrs. Vickers applied this system to a barrel-heating furnace 36 in. by 12 in. by 3 in. inside, which resulted in their coming to an agreement to establish this system throughout their works.

TABLE I. GAS CONSUMED IN A 20-LB CRUCIBLE FURNACE MELTING 70:30 BRASS

lb. of 70/30 brass melted	From Cold C. Ft. Gas used	C. Ft. per lb.	Second Heat C. Ft. Gas used	C. Ft. per lb.	Third Heat C. Ft. Gas used	C. Ft. per lb.
12.56	42.0	3.36	..	..	..	..
15.0	51.0	3.4	..	..	...	...
16.0	52.0	3.25	..	..	..	..
20.0	66.0	3.3	..	..	..	..
18.0	60.0	3.75	..	..	..	...
19.0	55.5	2.89	..	..	..	...
20.0	55.0	2.75	...	..	...	...
19.75	..	..	10.0	2.1	...	...
14.0	..	..	..	..	27.0	1.92
20.0	58.0	2.9	...	..	..	...
20.0	53.0	2.65	...	..	...	...
20.0	..	..	36.0	1.8	..	...
14.0	...	...	..	...	..	2.08
20.0	56.0	2.8	...	...	..	...
20.0	..	...	41.8	2.09	..	...
19.5	77.5	3.98	...	...	...	...
20.50	...	2.83	19.25	2.0	18.50	1.86
20.0		...	28.5	1.4	..	...
20.0	56.0	2.8	...	...	...	...

As an indication of the correctness of the principles employed, the author would point out that a light worked by means of a pressure balance feeding a small incandescent mantle will produce 130 c.p. to 150 c.p., with a consumption of under 3 cub. ft. per hour of town gas of standard calorific value; whereas it can be stated, on the authority of Mr. J. G. Clark, that the highest candle-power light obtainable at this pressure by other systems averages 22 c.p. per cubic foot of gas consumed (variable, of course, owing to the atmospheric burner).

Economy Possibilities

To show the saving to the country that would be brought about by use of these devices, it may be recorded that:—

1. A 3-in. pressure balance saves 50,000 cub. ft. of gas, or 5 tons of coal per 10-hour day, compared with a Brown and Sharp furnace, which is considered by all small arms factories to be the best on the market.

2. One thousand of these devices, in the manufacture of which 240 tons of combined iron castings and steel sheeting would be required, would save in six months—*i.e.*, 180 ten-hour days—the gas distilled from 900,000 tons of coal.

3. Should the barbarous use of raw coal as fuel, which in itself is most wasteful, be discontinued, and this system be found to be equally economical with all forms of producer-gas as with town gas, then in this country alone, where 250,000,000 tons of coal are raised every year, these devices would save half this coal; or, in other words, they would double the industrial possibilities of England.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

RECLAIMING FUSE PARTS

By G. C. White

IN spite of the usual care and precautions taken in the manufacture of munitions, a certain proportion of defects are bound to occur. Often, in the case of fuse parts, the injury may be of such a minor nature as to allow it to be rectified at a profit. The following is an outline of some particular operations and tools which are commonly employed in reclaiming fuse parts.

Primarily when starting on work of this nature and when laying out the shop manufacturing tolerances, due thought should be given to the way in which the drawings are dimensioned and allowances made to permit of rectification. In manufacturing it is generally only possible to take metal off, or if one dimension is low the adjacent dimension must be made correspondingly low. Metal may of course be pressed to suit a small tolerance and the spot from which this metal is deflected may have sufficient tolerance to permit of this. It must also be determined how much labor can be placed upon a piece which is to be reclaimed and yet make a profit. In estimating, the difference between the value of the raw material and the scrap value of such must be considered.

There are many points about the fuse which are not vital and yet, in reclaiming, it is advisable to state to the inspection department what you purpose doing and what it will affect before you start. Many failures have resulted from and much money has been lost by lack of co-operation between the government representatives and the manufacturers.

Adaptability of Brass

The comparative ductibility of brass is a particularly useful feature in fuse manufacture and a few examples are given hereunder which will serve to illustrate the range of operations possible and their application to fuse rectification—their success being dependent on the facility with which brass may be bent, drawn, expanded and compressed.

Suppose the inside of bore is important and the outside measurement of the

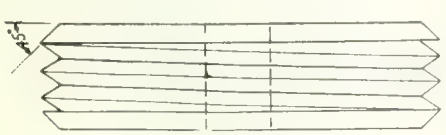


FIG. 1.

wall surrounding is of no consequence. Then a tool can be made which will turn the metal from the outside to the interior. If the outside is important, then the wall thickness will have to be increased by compression from the high length dimension to the low length dimension. Compression will distort the form so that after this is done it will be necessary to remachine, setting the tools to the correct limit by means of set blocks, which is the only way to set

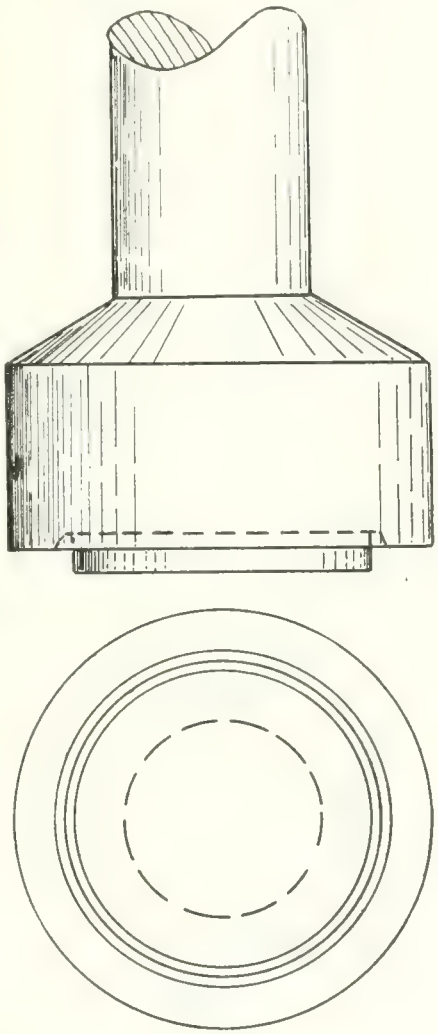


FIG. 2.

gang tools when some are set to the high gauge limits and some are set to the low gauge limits at the same operation.

Main threads are sometimes low, particularly when plain no-go ring gages are used, and when chaser thread millers are used there is a likelihood of a flat spot where the cutters start and finish. These low threads can be rolled up or the base of fuse can be compressed or hammered if there is enough metal there to permit of re-machining.

Regarding Rolling

Rolling is a relatively slow operation requiring some little time, depending on the ductility of the brass. About 10 minutes is sufficient for a relatively hard material and half this amount for soft material. The angle of the thread on the roll, as shown in Fig. 1, must be more acute than the angle of the thread to be rolled. The thread should be a sharp V and not have a flat top, as a flat head requires too much pressure and will not make a good smooth job. Coal oil should be used as a lubricant to prevent discoloration, which will occur if ordinary lubricating oil is used. After hardening, the roll should be polished with emery on a circular brush to remove the oil and any roughness.

The speed of roll should be so regulated and the diameter such that there will be a minimum of slippage, which cuts away the brass. The roll should revolve of itself freely through contact with the work. Generally the diameter of the roll blank should equal the pitch diameter of the threads on the work. Two and one-half threads to the roll is about all that can be used, as considerable pressure is required, and an ordinary man cannot exert any more pressure with a lever feed than a roll of this size requires. On automatic screw machine work one thread to the roll is the most satisfactory, but for reclaiming work 2½ threads have been found to give the best results. The last thread of the roll tends to break off if there is no provision made for support, and an angle of about 45 degrees is sat-

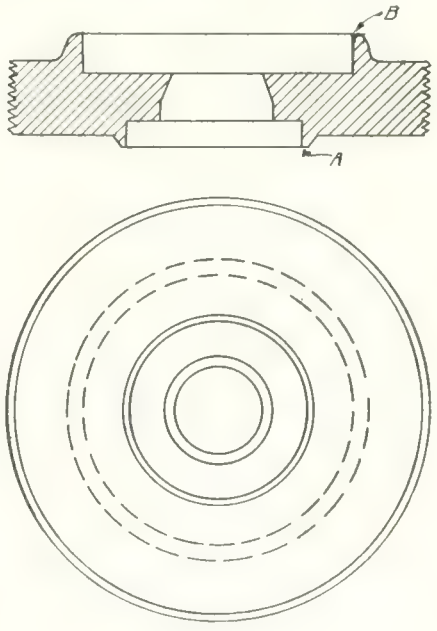
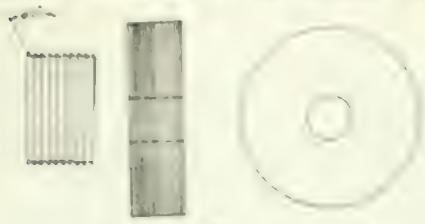


FIG. 3.

isfactory. Nickel steel containing 3% nickel and .12% carbon should be used, but good results have been gotten with Paragon steel. For a right hand thread the rolls should be cut left hand, that is, the thread on the roll should be the opposite hand to the thread on the work.

Another form of rolling or burnishing tool is shown in Fig. 2. It has been used successfully on the disc B shown in Fig. 3 as a sample of work which required rolling and which easily be-



came dented when handled carelessly. The freer the material is from oxide and dross, the easier can the operation be performed. A light lubricating oil is put on with a brush and pressure lightly applied while the tool is revolving in a drill press at about 1,800 r.p.m. Care must be taken to see that the tool is very smooth or the lip will be torn.

Still another form of rolling tool is shown in Fig. 4. This tool makes a series of grooves in the metal and forces it between the grooves of roll which are only concentric and not helical as in a roll revolves by contact with the work. The roll is not allowed to break contact after the cutting operation has commenced, because it was found that by so doing the metal would be torn and

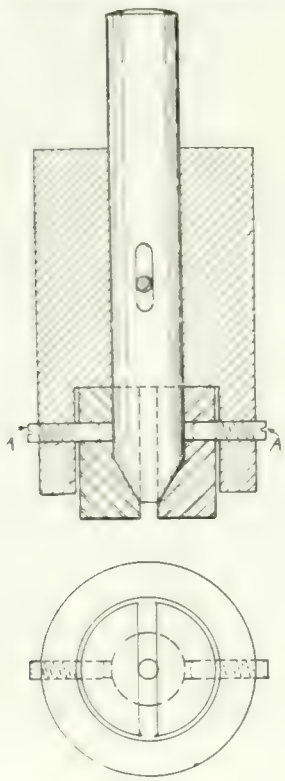


FIG. 5.

cut, as there is a small amount of creep or angularity to the roll due to the slack in the machine or tool holder. Coal oil or kerosene is used as a lubricant. After the part has been serrated, the tops of the serrations are bent over, making a smooth appearance except for evenly spaced light concentric lines, making the part appear as though it were made of discs. The tool which bends over the tops of the serrations is only moved in the one direction, the pressure being relieved before moving the cross slides of the lathe for another bending or burnishing operation. The burnishing tool is an ordinary piece of tool steel rounded on the deep side and the corner left stoned off, so that it will not cut. It is possible to put on .004 inches in this manner if the material is soft brass. An operation of this nature has been performed on steel with satisfactory results, but the roll was made with a inch is satisfactory.

An expansion tool (Fig. 5), which is used for expanding the rib B (Fig. 3), is shown with leaves which will not loose

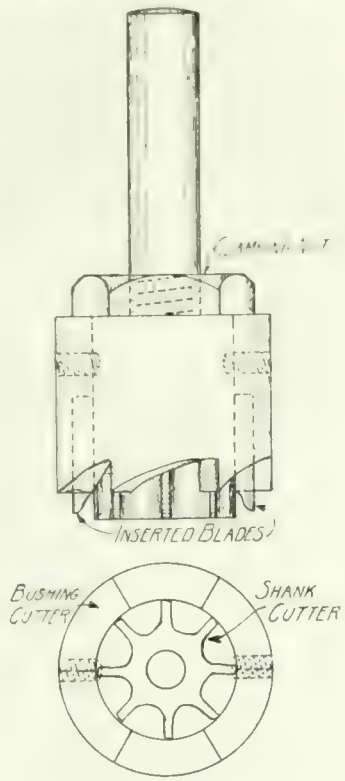


FIG. 6.

their spring, become distorted or break. These leaves are held in place by pins shown at A. After expanding with this little tool the shape may not be satisfactory, and it is necessary to go over the form with a form cutter (Fig. 6) which eliminates any possibility of a mistake.

Another form of expansion tool for bending out the dents in the rims of bodies is shown in Fig. 7. This tool is operated by hand and a girl can repair 2,500 dents in 10 hours. The small gib which does the work is operated by a handle which has an eccentric on the end. Very heavy dents are roughly straightened as much as possible and they are further shaped with a hammer, a flat piece of steel being wedged in behind the rim to form the brass to, and to act as backing. If the dent should be so heavy as to damage the graduations, the body must be filed after hammering and then engraved. So numerous are these defects in a production of, say, 15,000 in 9 hours that one operator could be kept busy all the time on this work. The engraving tool was made from a piece of three-cornered steel and a production of from 500 to 1,000 was ob-

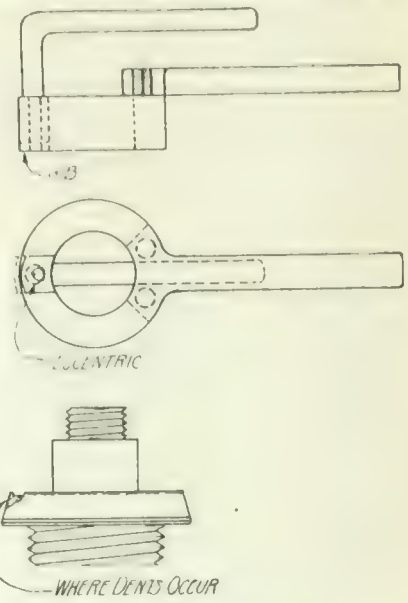


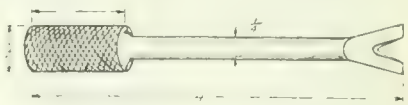
FIG. 7.

tained, depending on the fact that the repairs may be heavy or light, for the whole day.

A THUMB-TACK LIFTER

By E. Bailey

TO prevent thumb-tacks from obstructing the tee-square, it is necessary that the heads be perfectly flat on the drawing-board. The pressure of the thumb is not always sufficient to force these down deep enough, and they then require to be hammered down. In the accompanying sketch is shown a simple tool, used both for pounding down and lifting out the tacks. It is made from ½ in. round stock, and turned up ¼ in. dia.



within one inch of the end. The small end is then flattened out for a claw. The hammer end is knurled as shown.

CAUSES OF SHORT FEEDING ON AUTOMATIC SCREW MACHINES

By D. A. Hampson

ONE of the most vexatious things an automatic screw machine operator has to contend with is "short feeding" or not feeding at all. The operator of limited experience who has to rely on his own resources is often very much puzzled as to why the bar does not move out on certain occasions while it does at others with the conditions apparently the same. There is a strong temptation to resort to springs and expedients of the contraption sort to overcome the feeding

troubles when the real source of trouble is not evident after a careful study, but it must always be borne in mind that the machine has worked all right and will continue to do so when some little overlooked point is discovered and the hitch removed. Feeding troubles may be divided into three divisions, those arising from the chuck mechanism, from the feed tube mechanism, and from the stock and rack.

Chuck Troubles

The collet does not have spring enough—it is either too light or has not been spread open enough when hardened to make it force itself back and (in the push type) with it the push tube.

The nose piece may have become roughened on the inside and thus prevent the collet from opening.

The nose piece may be just a little soft which is a cause of the collet dragging in opening.

The collet push, or closing, tube may be stuck or gummed up, thus offering too much resistance to the spring of the collet.

Collet rough on the outside causing it to stick in the nose piece.

Collet soft on the tapered or front end causing sticking.

Collet rough on the inside, rough enough to retard the forward movement of the stock.

Collet may be hard outside but soft on its gripping surface and become burred up, thus retarding the stock.

Construction of chuck is such that the collet cannot open wide enough to take care of the variation in size of the rough stock being run.

Dirt between collet and nose piece preventing free movement.

Feed Tube Troubles

Grip of feed finger too light to overcome frictional resistances of the bar: either the finger has not been hardened with the jaws closed or the split is not wide enough to let them close.

Feed finger may have come unscrewed from the feed tube.

Draw back cam may be set to feed just the length of the piece to be made and no allowance made for the inevitable losses.

Feed tube may stick through being bent, and has shifted the cam.

Feed tube and bar in it stops revolving—it is sometimes found advisable to provide means of positive rotation.

Feed tube soft and wear has lessened its grip.

Stock Troubles

Bar may nearly fill the tube of the stock rack and the latter not being quite straight, the bar sticks allowing the feed finger to slide right over it without feeding full amount.

Bends in the bar of stock—no machine will feed satisfactorily on stock that has crooks in it.

Bar is too big and collet is not quite free of it when opened.

Bar is so rough, scaly, or bruised that it sticks at certain spots.

If a careful examination is made with a view of eliminating all the troubles above or any one of them which may exist undiscovered, it is a practical certainty that no feeding troubles will then bother. Whether the work is run wet or dry, it is a good plan to put slips of rubber between the jaws of the collet to keep out the chips and coolant which sooner or later find their way inside the chuck and necessitate cleaning out to insure proper feeding. The rubber also adds spring to the collet.

PATTERN-MAKING NOTES

By J. W. Broadbent.

FOR turning work between centres the spur and cup centres, Figs. 24 and 25, are the best to use. The ordinary 60° centres are sometimes used, but unless large heavy patterns are being turned, and a centre plate is put on each end of the job, these centres are better left on the metal turner's lathe. When used on split patterns, the 60° centre has a tendency to force the joint apart.

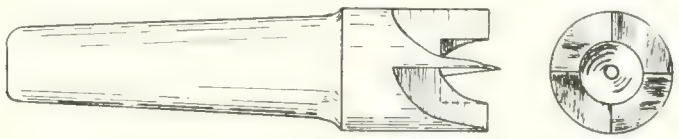


FIG. 24.

Lathe Centres

The spur centre, Fig. 24, is the driving centre. It has a central point and four spurs. By making one spur narrower than the remainder, work which has to be taken out of the lathe can be put back again so that it will run true and occupy its former position.

The cup centre, Fig. 25, is the dead centre, having a central point surrounded by a wedge-shaped ring with a sharp edge. The cup centre should be provided with an oil hole as shown, and when the centre is put in the lathe this hole should always be at the top.

A very effective method of lubricating the tail centre is to fill the inside of the cup with grease before placing the work between centres; grease being thicker than oil, does not soak into the wood so readily.

The central points may either be turned out of the solid metal or inserted separately into a hole bored in the centre, the latter method being preferable, for when the points become worn or battered they are easily renewed. The only reason for these centre points is to locate the centre of the piece to be turned; they do not in any way support or drive the work, being too light for this purpose.

Keep Centres Sharp

When turning patterns in halves it is necessary that the exact centre be located, and this cannot be done with a blunt centre. A sufficient angle is 20°, and the point should project beyond the end of the spurs and in the cup centre beyond the ring.

The ring of the cup centre should be bevelled on the inside, as shown in Fig. 25, not on the outside, as is often found to be the case. It can easily be seen that when work is being turned in halves the inside bevel will have a tendency to clamp the pieces tighter together. When the bevel is on the outside of the ring the tendency is to force the two halves apart.

Fig. 26 shows a driving centre, having a centre point and two wings, one wing being curved, so that work may be replaced in the lathe to occupy its former position.

This centre is useful for turning solid work, but for split patterns the spur centre, Fig. 24, is to be preferred.

Patterns in Halves

When turning patterns in halves, the two halves must be secured firmly so that there is no danger of their coming apart in the lathe.

It is often necessary during the process of turning to take the pattern apart, and in such cases the best method is to leave the stock longer at each end and secure the two halves with wood screws placed in this waste wood. Long slender work will require screws to be placed at intermediate points between the two ends; they should be well countersunk below the surface, so that the turning tools will not strike them.

Another method is to leave the stock longer than required for the pattern and glue the ends for a distance of about ½ in., allowing the glue to set hard before turning.

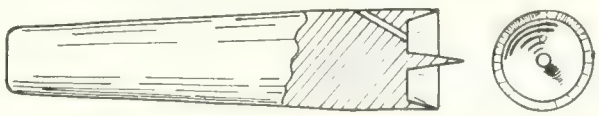


FIG. 25.

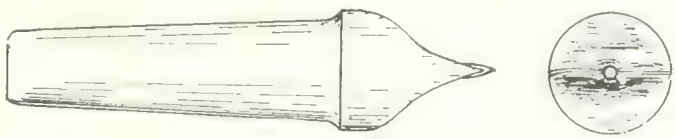


FIG. 26.

The glue will form a hard joint at each end, and great care must be taken when centreing the work so that the centre will not run into the softer wood.

Centreing the Work

A fine centre gauge is the best tool to use for centreing work. Preparing the lathe centres into the ends of a job is destructive as far as the lathe centres are concerned and unnecessary as a means of forcing the points of the centre into the work. Advancing the tail screw when the work is placed between the

FIG. 27

centre points gives sufficient pressure to force the spurs into the wood.

Fig. 27 shows the pinch dog which is often used for clamping the two halves of a pattern together while being turned. The corrugated pieces of steel, Fig. 28,

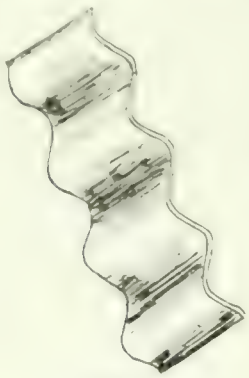


FIG. 28.

used by box manufacturers, are the handiest devices for holding small split patterns. They are driven at right angles into the end grain of the wood. Fig. 29 illustrates the method of using the pinch dog and corrugated clamps.

Driving Centre

When turning large work in halves the spurs of the centre, Fig. 24, would not have sufficient bearing to drive the job; the cutting tools employed would just prevent the wood from revolving and the centre would cut a groove in the end of the job.

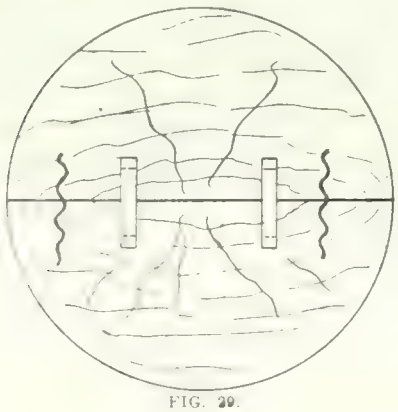


FIG. 29.

Fig. 30 shows a device made of iron to be used with the 60° centres. There is a centre line A B scratched across the face and a small hole is drilled at C.

On the driving end is a projection D shown by the broken line, which engages with a slot cut into the face plate.

For the tailstock end a hardwood plate is preferable to an iron one, lignum vitæ being the best wood to use, as it is hard and has an oily surface, thus making it run freely on the tail centre.

When hard wood is used for the tail end, either the 60° centre or the cup centre, Fig. 25, may be used.

There are many devices which will suggest themselves to the practical mind, both for saving time and doing better work in the lathe; some of these will be described as occasion demands when dealing with the construction of different patterns.

NAILS IN MOULDS

WHERE there is danger of angles washing away with the flow of the molten metal, it is a good plan to put in a few thin wire nails to reinforce the sand, nails which have fairly large heads being chosen. The heads of the nails should be slightly rusted by dipping into a not too strong solution of sal-ammoniac and water, and after drying they should be coated with a mixture of equal parts of clay and plumbago reduced to a paint with water. By pressing the heads well into the mould where they are likely to touch the metal, and dressing that part of the mould with plumbago, and sleeking down smoothly, chilled spots will be avoided in the casting. In no case, however, may rusty nails come into contact with the molten metal, or a faulty casting will result.

WEIGHING ZINC COATS

IN determining the actual weight of deposit of various zinc finishes the procedure will vary somewhat. The simplest way for hot dipped and sherardized parts is to strip them in strong hot caustic soda or potash, taking the weight before and after stripping. The area of the bare portion should be calculated and by dividing the loss in weight by the area in square inches the result is expressed in milligrams per square inch. If for any reason it is not possible or desired to strip the entire part, one or more small pieces may be sawed out and tested, says Metal Industry.

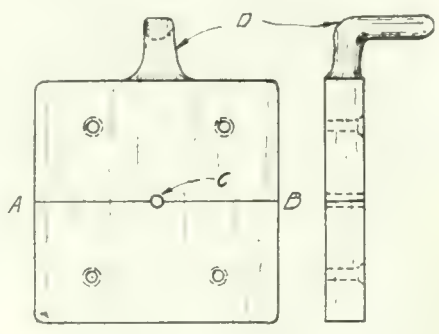


FIG. 30.

When examining electro-galvanized parts it will probably be advisable to determine the deposit on various surfaces. This may be done either by sawing out small pieces, as in the case of hot dipped or sherardized parts, or by coating the entire surface with wax, removing this at any desired place and taking the zinc off with dilute hydrochloric acid. Copper plating the part previously to applying the zinc will aid in telling when all of the latter is removed. It must be remembered that beeswax is very easily saponified by caustic alkalis; therefore, it is not possible to employ such agents in place of acid when stripping certain areas, the rest of the part being covered with wax.

After the zinc is in solution it may be determined either by the ferrocyanide or electrolytic methods, given above. In any case the solution will contain more or less iron, which must be taken out. To do this add a few drops of strong nitric acid and boil for several minutes. Now add a gram or two of ammonium chloride, sal ammoniac, and an excess of ammonia water, which will bring the iron down as a voluminous red precipitate. Heat the solution a few minutes, let settle and then filter, washing the tion containing 10g. ammonium chloride and 5 c.c. ammonia per 100 c.c. of water.

The filtrate, the liquid which runs through the filter, should now be evaporated to hard dryness over a hot plate, the residue moistened with strong hydrochloric acid and evaporated again. This should be repeated, then, if the ferrocyanide method is to be employed, two or three cubic centimeters of the acid and about 75 c.c. of hot water added and boiled if necessary to take everything in solution. It may now be neutralized with ammonia, then acidify slightly with hydrochloric acid and add three cubic centimeters excess, after which it is ready to be diluted, heated and titrated as before.

If it is desired to use the electrolytic method, the procedure is the same up to the point of addition of acid after evaporation to dryness. In this case strong sulphuric acid should be added instead and the whole carefully heated until dense, white fumes are given off.

Allow to cool, then add a few drops of the acid and about 75 c.c. of water and boil. Let cool, neutralize carefully with sodium carbonate and proceed with the analysis as given above.

BROWNS are produced in different shades on copper depending upon the length of time the work is immersed. Excellent results are obtained by using ¼ ounce of potassium or sodium sulphide mixed with 1 gallon of clean water. After immersing, the work should be dipped in a solution of nitric acid in order to set the color.

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ELLIPTICAL LATHE WORK

By R. Hamilton.

THE general practice of irregular turning is not very frequently met with in the work of the average machine shop. Work of such a character invariably necessitates the adoption of specially designed machines or attachments to accomplish the desired purpose. The duties of a lathe, even those of the most modern type, are usually supposed to be the performing of such jobs that require turning or boring—in whole or in part—to an accurate cylindrical form; or for work of irregular shapes but with the various sections concentric with the central axis. Where the machine surfaces are not generated from a common center in the turning of ovals, ellipses, or various shaped cams, the use of a special device or attachment is necessary. Master forms or cams are the means generally adopted in the making of odd-shaped pieces; but broadly speaking, each specific shape requires a master cam of suitable form and dimensions from which the work is developed.

A job closely allied to cylindrical work done by lathes is the production of oval shaped pieces, such as elliptical dies for various sheet metal purposes. In the ordinary eccentric the characteristic features are the two separate cylindrical portions, each having its own distinct center or axis. In the development of the ellipse the peculiarity rests in the fact that the perimeter is derived from what might be termed the continual changing of the location of the two centers from which the outline is developed. In a true ellipse the diametrically opposite radii which pass through the intersection of the major and minor axis are always of equal length. An ellipse is derived from the cross section of a cylinder cut at an angle—other than a right angle—with the axis of the cylinder; or the mechanical projection of a circle tilted at an angle to the plane of projection. The dimensions of an ellipse are governed by the angle of inclination with the plane of vision.

Graphic Generation

Fig. 1 illustrates a common method of generating an ellipse by the graphical process; the accuracy of which depends upon the number of divisional points on the generating circles, and upon the skill of the operator in tracing the irregular curve. There are several geometrical methods of constructing a true elliptical outline, and still others that are more speedy, but not quite so accurate. The principle here shown is the development of the curve through vertical and horizontal intersections drawn from the equidistant divisional points on the generating circles; these circles being struck with radii equal to one half the length of the major and minor axis respectively. As a lathe spindle revolves at a uniform speed about its own axis it is obvious that a reciprocating movement must be given to the tool or to the work, in order that shapes—other than circles—can be turned. It will be seen by reference to Fig. 1 that each angular division having X as a center will be traversed in the same period of time, but the radial distance of the desired outline will require to be constantly varied to develop the curve.

Turning Device

A device that has been used for a number of years in a large sheet metal working plant in Central Ontario, for the production of elliptical dies for tin can the device, the lathe chuck or face plate is removed from the nose of the spindle and the piece A screwed on; the outed on; the outer portion of this piece has a length equal to about 2½ times its width, and is dovetailed on its length to fit the outer piece B, the nose of which is fitted with a thread-making, is illustrated in Fig. 2. This attachment can be designed for any make of lathe, but must be constructed to suit the dimensions of the machine upon which it is to be used, as the centre height is an important factor in its successful operation. To apply

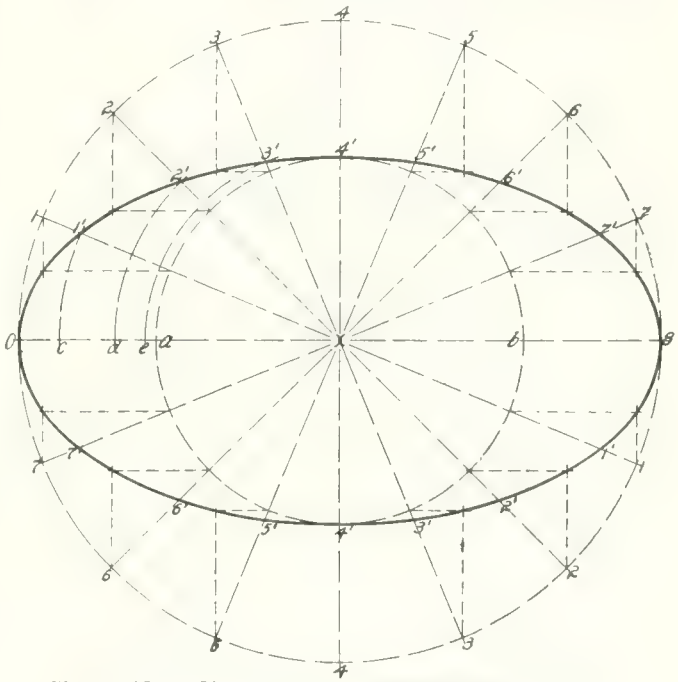


FIG. 1. GRAPHIC METHOD OF GENERATING ELLIPSE.

ed portion to carry the chuck or face plate of the lathe. The main support D that provides adjustment for the variable diameters of the work is firmly secured to the shears of the lathe so that the slide on the extending arms is in a central horizontal position. The piece E, that governs the dimensions of the ellipse, is adjustable in a horizontal direction, the center having no vertical movement. The bore of the bronze bush F is a neat revolving fit on the projection of the piece E, but the outer edges of the bush are in the form of an oblong, the longer side fitting into the slide on the back of the outer slide B. A gib G is fitted to either side and is accurately adjusted for friction and position by means of the set screws H. A gib I is also provided for similar adjustment on the sliding portion of A and B.

The operation of the device is as follows:—After the face plate has been removed from the nose of the spindle, the attachment is placed on the ways of the lathe and the piece A screwed firmly to position—when doing this it is best to have the parts D and E located centrally, as the movement of the slides has no appreciable reciprocating travel. When the piece A is in position on the spindle nose, the support D is secured to the shears of the lathe, care being taken that the projection of the piece E bears against the back of the piece A, but not too tightly to interfere with the free movement of the device. The piece E is then moved forward to a position off center equal to one half the difference between the major and minor axis of the ellipse to be turned; this distance being represented by the line O-A in Fig. 1. The face plate that is to carry the work is then screwed to position on the front of the piece B. When fitting the face plate it is advisable to have the slots come in a position corresponding to the action of the respective slides as it makes it more convenient when clamping on the work. With the work in position and the lathe started, the movement of the spindle is transmitted to the work, but in addition to the latter having a circular motion it also has a reciprocating motion in a horizontal direction. By a study of Fig. 2 it will be seen that the piece A will revolve B, the latter in turn sliding along A and also at right angles to A along the parallel portion of the bush F, so that when the device has turned through

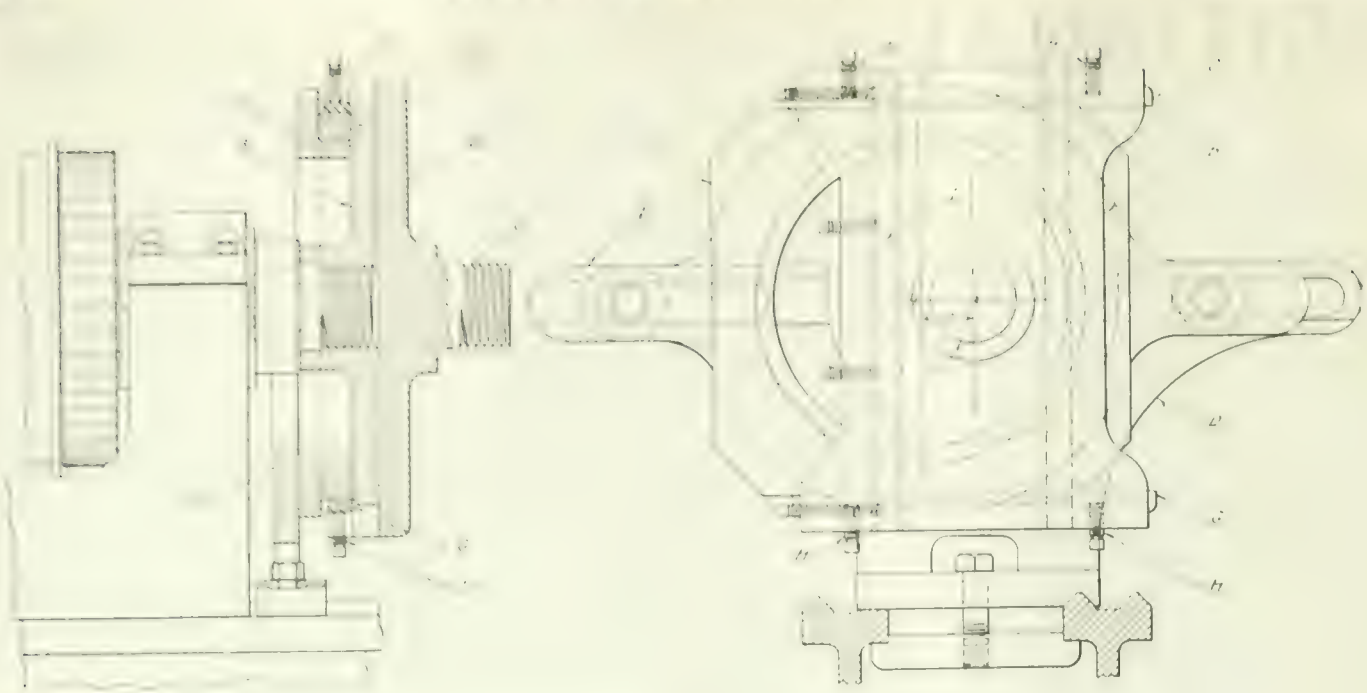


FIG. 2. DEVICE FITTED TO LATHE FOR TURNING ELLIPTIC FORMS.

an angle of 90 deg., the center X will be at the point Y in the same horizontal line. The triple motion, that of revolving and sliding in the two directions causes the cutting tool to trace the irregular curve 0-1'-2'-3'-4". During the next period of 90 deg., the reverse action takes place until the point 8 is reached; this cycle of operations being continued while the lathe is in motion. It will be noticed that the piece A is free to slide clear of the ends of the piece B when the tool is working at or near the minor axis; the gib G extending across the gap and retained in position by the end lugs shown.

EDITORIAL NOTE.—Several readers are doubtless familiar with similar devices more or less complicated than that shown by our correspondent. The need for turning ovals, when it does arise, is usually urgent, and the desirability of being familiar with existing methods and their adaptability to such occasional requirements would impart more than passing interest to such devices as other readers are familiar with.

HOW TO SAVE COAL

ON several occasions since the war broke out Governor Whitman of New York State has sought the advice, by conference, with the editors of the leading trade and technical papers on important business, manufacturing and economic problems.

Recently at his request a committee of editors of technical papers prepared a list of suggestions to manufacturers and business men and the public generally on the saving of coal. The Governor pointed out that the production of anthracite and bituminous coal would doubtless be greater than ever before, but on the other hand the consumption far exceeds the requirements of past periods, and he insists that the American people can avoid distressful conditions this winter only by exercising the greatest care and intelligence in the use of coal. The following are the suggestions which the committee prepared for the Governor.

Suggestions to Public.

The suggestions which the committee requested the Governor to make public follow:

Don't burn coal in an open grate, for in such a practice 75 per cent. or more of the heat goes up the chimney.

It isn't necessary to have every room heated. Most people would be healthier if they slept in cold bedrooms. Close off spare rooms.

Examine furnace and see that there are no cracks at floor line to permit air leakage into the ash pit. Make sure that all firing, ash pit and cleanout doors are airtight when closed.

Endeavor to keep the entire fuel space of your range or furnace filled, heaping the coal slightly in the centre. Steam or hot water boilers should be filled so that the coal is level with the bottom of the feed door opening. Don't let the fuel bed burn down too low. Thin fires mean waste. Break lumps to about egg size.

Frequent Feeding Wasteful

Feed the fire and shake the grate at regular intervals. Two or three times daily is generally sufficient unless the plant is inadequate for the service required. Frequent feeding and shaking are uneconomical. Shake down the ashes before adding fresh coal and stop shaking the moment the first bright spot appears under the grate. In mild weather let some ashes accumulate on top of the grate; in severe weather have only a very thin layer of ashes on it.

If, however, the fire has burned very low and more heat is desired open damper in the ashpit and add a small quantity of coal. In this particular case do not shake the grate until this fresh coal is well ignited, then shake down the ashes and again add fuel.

Don't leave feed door draughts open and admit cold air over a glowing fuel bed at any time. The feed door damper should be opened only to admit air over a fresh fire. Air for combustion should be drawn through the burning bed of coal and, as a general rule, all checking of draught should be accomplished by closing the ashpit damper and opening the check damper in the smoke pipe. The check damper should never be opened until the ashpit damper is closed. The shutoff damper in the smoke pipe may be closed partially in case of an unusually strong draught or to check the fire in mild weather, but, as a rule, this damper should be touched very seldom. Never check by leaving the firing door open.

Before feeding a furnace see that the shutoff damper in the pipe is open and close the check damper. This prevents the escape of dust through the feed door into the cellar.

Keep the ashpit empty. Ashes banked up under the grate prevent necessary air circulation, hinder combustion and tend to warp the grate bars. Remove ashes at least once daily, and be sure to sift all ashes to recover the good coal that has dropped through the grate.

Serious fuel wastes result from allowing soot or ashes to be deposited on the interior heating surfaces. This prevents utilization of the heat in the smoke and gases. Clean flues frequently; with soft coal every other day is none too often to give the furnace a brushing down. One-eighth inch of ashes and soot on boiler surfaces retards heat transfer 25 per cent.

MAKING GREATER STRIDES

By J. E. Cooley

ACROSS the twenty centuries reaching down to the present day, we know that the human race as a whole has never measured up even to the slightest degree of its possibilities; that men still live and die in primitive surroundings, in huts, in hovel-like structures as in times past; that few living beings aspire to the highest progressive state that it is possible for each one to reach. The distance which we have progressed thus far, it was possible to arrive at a hundred years ago; and it is possible now to so energize ourselves, as to, in the present time, attain that state to which, a hundred years hence, mankind will have then advanced.

Our great drawback is our blind indifference, our disinterestedness and neglect to do what pertains to our betterment and our own human good. Our boastfulness far exceeds our accomplishments, and much time is wasted and spent in preparing to do the things that we never even begin, or least of all never finish. We tend toward a don't-care, undefined sort of individualistic growth. We fall easily down on each job. We lack the gripping force to make what we do count in any extraordinary degree. A little exertion tires us. A little sweat on the forehead wilts us. It is not of any particular consequence that man should labor by the sweat of his brow. But his sweat, his perspiration, should emerge from every pore in his body.

Do We Profit By Experience?

Oh, for a race of alert human beings, A race of which we could be honestly proud! A A class of mortals that no age has even dreamed or thought possible! We step into each new day, leaving behind us the yesterdays in which we have lived; forgetting all we have thought and talked about in the day before; coupling little or making no connections with what we have experienced and planned; in a word we die daily, we drag out of one day into another. The mudfly is born at sunrise and dies at sunset, and we would follow the same course, but for a fortunate circumstance of our natures we are given a longer duration of existence. But nevertheless, we in vast numbers fulfil no greater office than the mud-fly. For the reason that our inaction and the unprofitableness of our forgotten yesterdays are going to be repeated in our to-days and to-morrows.

A man should be so developed, so strong, and so energized, that he should be capable of making greater strides of such constructive ability as has never hitherto been displayed by any known type of human mortal. His scope of action should be extended beyond the mere drivelling, monotonous tasks he pretends to be daily doing. He should with apparent ease handle a hundred irons in the fire. His reach should outstretch a hundred miles instead of that number in square feet. Instead of one small vicinity he could be ruler of a hundred. Instead of being one human being he could be several unto himself. His capabilities, his lines of action, instead of being the stunted and half-hearted common everyday sort, could expand to proportions that might girdle the earth.

Few of us realize the great encircling distance of this globe on which we live and move and are capable of acting. We have not even yet begun to train our imagination to the point of realizing the things of earth and sky, from where we stand in our present surroundings. We make little effort to penetrate in any clear searching manner the big things of life. Nor do we attempt to dissect down to the smallest detail the things that concern us most.

The Need of the Hour

It is just this penetrating power, this dissecting process, that we are so much in need of in the present hour. It is utterly useless to make any attempt to undertake any particular task, if we do not know beforehand exactly what we are to do; if we have not beforehand carefully planned it all out, putting detail beside detail, moving things in a thoroughly progressive order without deviating one iota from our prescribed course.

A great deal is said about concentration. Concentration is, or it may be likened to, some little shifting free acting molecule that has its abode in the brain of each one's cranium. Innumerable attempts have been made to hold it steadily in place to serve one's purpose, to keep it composed and directed on some particular aim or task. But too often does it deflect or wander off away from that on which it is attentively needed. And it is for this reason that we fail to carry forward from one day to another, or from hour to hour even, our feeling of energy, of enthusiasm, and pursue steadily onward the task we have it hand.

We all admit that lagging and laziness exceed the pushing power contained in each one of us. And this is because we have not practised to any great degree how to make our actions or efforts more stable. That is, we have not cultivated more steady staying power in ourselves; more rhythm in our movements; overcoming tiredness with tirelessness; being brief and short and sure-hitting in place of our present state of lagging, dragging and uncertainty.

Usefulness of Aim Essential

We should all of us be daily engaged in working for some permanent and useful end. Each on some interesting separate task. All the force of concentration should be trained and directed without any dodging, side-stepping or backing against the ropes. We should weld our actions of yesterday into those of to-day. There should be no disconnecting link, but one onward and upward steady growth and development till the thing we are engage in doing is accomplished into one perfect whole.

No man, woman, or child should be exempt from being made to move forward, to outgrow the present status and forms of disinterestedness and neglect on the one hand, and shiftlessness and carelessness on the other. We overdo the art of teaching babies to prattle and lisp, instead of to talk, and children to play instead of practising useful pursuits. Not until we come to realize the necessity for this, are we going to develop a race of men and women, having more sense and saneness, and less of the spirit of lethargy and helplessness that the most of them now possess.

ACCIDENTS ON OVERHEAD TRAVELING-CRANE RUNWAYS

ENGINEERS and designers have devoted a great deal of effort to the design and construction of cranes with the idea of producing machines that are both efficient and safe, and while their work has materially reduced the hazards in crane operation there are still a great many accidents that result from the daily use of equipment of this kind. This fact is easily demonstrated by the accident reports from plants equipped with the latest types of cranes and safeguards, and the trouble can be largely attributed to the "human element" which must always be considered. Accident prevention in the case of cranes must rest to a certain extent with the workmen, and they should protect themselves by taking every possible precaution.

Most users of cranes are familiar with the causes of the commoner accidents and provide the necessary safeguards for such, but some of the rarer and less obvious causes are equally important, although because of their seeming improbability they are usually lost sight of or are neglected. Discussing these less frequent accidents, the *Travelers' Standard*, in a recent article, considers the most common cause of accidents on crane runways.

Most of the commoner accidents that are likely to occur in the use and operation of cranes have been discussed in previous issues of that publication, but some of the rare ones are equally important. It is only natural to properly safeguard those places or machines which are productive of frequent accidents, but those in connection with which accidents are seemingly improbable are usually lost sight of, or are neglected. In this article, it is our purpose to call attention to some of these more or less infrequent accidents which occur in crane work.

Possibly the most common cause of accidents on crane runways consists in men working on the runways without taking sufficient precautions for their own safety. This trouble was not considered serious with the older type of noisy steam crane which gave plenty of warning of its approach, but the introduction of electric cranes has altered this condition. Workmen are quite often run down or knocked off the runway by the crane bridge or trucks.

At first thought, it would seem that the crane operator would be able to safeguard workmen on runways from these

work on the runway, it is easily possible for him to forget their presence, or he

and other objects needed for the repair of a crane. In making repairs or additions to old equipment, or in the installation of new equipment, the use of a portion of the runway as a place to stand or walk should not be allowed, if it is possible to do the work in some other way and thus avoid inconvenience may be caused. Do not use the runway in climbing from one part of the building to another. If these precautions were heeded a great many of the difficulties would be overcome. Occasionally, of course, men must be upon the runway,—as for example, in the repair of the runway itself, which would require the service of the men on or near this source of danger. At such times other means of protection would have to be sought.

The safest practice would be to stop all operations of the crane, anchoring it or blocking it so that it cannot move. This, however, does not meet with general favor because the importance of the work for which the runway was being used might hardly warrant a shut-down. Therefore, when a man is obliged to work on a runway he should first of all notify the craneman. A warning flag should be hung from a near-by column in plain sight of the craneman; or track torpedoes, placed on the rails at suitable locations, may be used for the same purpose. In addition to the use of danger flags or torpedoes, portable rail stops or buffers should be clamped to the crane rails a few yards from the point where the runway is being used. This procedure will isolate that section of the runway on whics acidents might occur, and if the crane operator forgets the man on the runway, or fails to note the warning flag or the torpedo, the buffers will insure the safety of the workmen.

Track stops or buffers, although strongly recommended as a means of protection, are often cast aside. If they are supplied, they are often at some inconvenient place, or their whereabouts are unknown. The men frequently object to them, too, on the ground that time and labor are required to install and remove them. Often workmen who are to be on the runway only a short time would rather go unprotected than take the trouble to attach the buffers. These conditions should be improved, and in case the buffers are not supplied, the workmen should have a stout rope safely fastened in some convenient place, so that they may easily slip down to the floor in case of danger.

The electrical hazards which may be encountered by workmen upon runways are very serious as the trolley wires are necessarily uninsulated, and the voltage carried is comparatively high. Under these conditions there is not only the possibility that men may be electrocuted, but also that they may fall from the runway as a result of slight electrical shocks. If for any reason workmen are required to use any part of the runway where this danger is present, the power to the trolley should be effectively disconnected by means of a safety switch provided with a locking device so that the current cannot be turned on again until the workmen are safely away.

In addition to substantial stops or buffers secured at the extreme ends of all runways to prevent the crane from leaving the track at these points, each runway should be provided with a suitable and substantial walk, properly guarded by railings and toe-boards, extending along its entire length on the motor side. A walk of this kind should be at least 6½ feet below the bottom of the overhead trusses. This addition, which may not be feasible on some existing installations, should be provided for all new runways. Such a walk would offer a safe retreat for workmen, and would be found convenient in making various repairs to the crane itself.

The failure of crane supports may be due to several causes which would include abuse, lack of attention, overloading, and inferior design, material, or workmanship. While each one of these causes may be, in itself, capable of producing a mishap, crane failures, like accidents of many other types, are not necessarily due to any one single cause, but to a series or combination of causes, all tending to a common end. It is for this reason that a great many failures cannot be satisfactorily explained. The following account of an accident will serve to illustrate this fact.

The accident occurred in a shop doing general foundry work. The building in which the castings were poured was adjacent to the yard in which the heavy flasks and castings were stored, so that the crane runway, which extended into the yard, served both for the building and the yard. Two cranes were used, and at the time of the accident one crane had just delivered its load to the yard and was standing on the outside runway. The second crane, with its load, had just come out of the building and was preparing to lower its load to the yard. Due to some cause, the runway under the second crane began to give way. This made a depression into which the first crane rolled. The additional stress at the defective point caused the collapse of the runway, and both cranes dropped into the yard, taking with them practically all of the outside structure.

No satisfactory explanation of the failure was ever made. Some said that the second craneman "plugged" or suddenly stopped his motor, producing such an exceptional stress that the runway was broken down. Others thought it was due to an eccentric loading on the columns which failed.

The runway had been in service for about ten years, and the bases of the columns were badly rusted, especially where they rested on their foundations. It was said that the outside runway swayed quite perceptibly when the crane was in operation. In all probability a failure of this kind would be due to a combination of causes; and in order to prevent other similar accidents it would be necessary to take special precautions to eliminate each of the various possible causes.

Defective material, inferior workmanship, and poor design are usually not serious hazards in our present day manufacturing methods. Rigid specifications and practical designs, accompanied by thorough inspection and tests of the materials during manufacture and erection, have practically eliminated all dangers from these sources. It is true that this will not always hold good, but the spirit of honesty in our American manufacturing methods has resulted in the production of exceptionally reliable products. Accidents from the failure of members of a structure are nearly always produced by other causes.

The crane runway is designed to carry certain specified loads, and if its safe capacity is exceeded some of the members may break, causing serious damage. The safe allowable load of the crane should be plainly marked on both sides, using figures large enough to be seen and read from the floor. While this is intended to prevent overloading of the crane itself, it will also tend indirectly to protect the crane runway. When two or more cranes are used on the same runway, it is never good practice to bring these cranes, if loaded, too near each other. This concentrates the weight, and may overload the runway in case it is not designed for such conditions. This precaution would be especially desirable where the original equipment consisted of but one crane, and where, because of increased demands, additional cranes were installed to operate on the original runway.

The proper care in the handling of the loads is a point that is quite frequently neglected by cranemen. When loads are suddenly stopped or started, or are carried in a jerky, swinging manner, an excessive strain is exerted upon the crane which in turn transmits it to the runway. Such conditions may easily cause strains equal to double the weight of the load that is being carried, and under conditions of extreme shock would cause the stresses to be increased indefinitely. Careful operators may easily overcome these dangers by properly adjusting the load, using care in taking up the slack of the slings and hoisting cables, in starting and stopping the crane gradually (not "plugging" or reversing the motor to produce a sudden stop), and in preventing the load from swinging.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

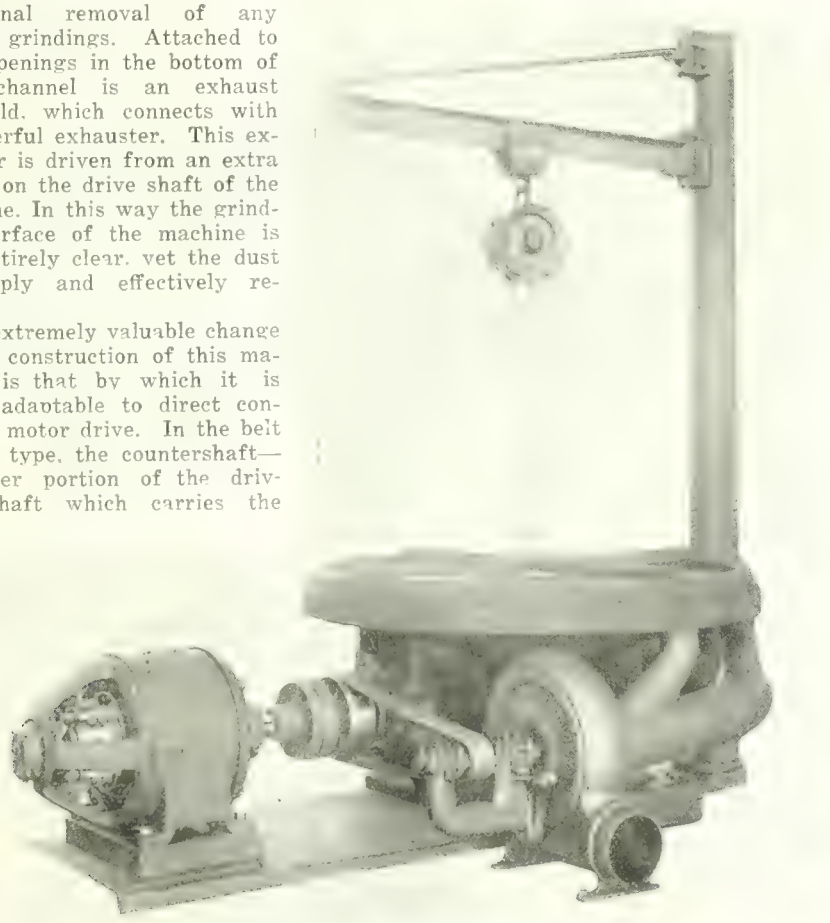
MOTOR DRIVEN, BALL BEARING VERTICAL DISC GRINDER.

THE Gardner Machine Company, of Beloit, Wisconsin, are now building a new vertical spindle disc grinder, which embodies several interesting features. Most conspicuous of these, as shown in the accompanying illustration, is the hoisting attachment, designed to handle the heavy pieces which this machine is built to grind, also to apply and remove pressure weights used in grinding lighter castings.

The attachment consists, briefly, of a one ¼ ton hand chain hoist, mounted on a trolley and swinging jib. A crane column to which this jib is attached is rigidly fixed on the base of the machine. By means of this arrangement, any heavy parts can easily be lifted from the floor and swung on to the surface of the grinding wheel. Another feature of this machine is the dust exhaust system, which is claimed by the makers to practically eliminate the dust problem. A channel is cast into the base of the machine just below and around the edge of the disc wheel. Above this and just over the edge of the disc wheel is fixed a detachable guard ring, which permits the occasional removal of any coarse grindings. Attached to four openings in the bottom of dust channel is an exhaust manifold, which connects with a powerful exhauster. This exhauster is driven from an extra pulley on the drive shaft of the machine. In this way the grinding surface of the machine is left entirely clear, yet the dust is simply and effectively removed.

An extremely valuable change in the construction of this machine is that by which it is made adaptable to direct connected motor drive. In the belt driven type, the countershaft—or outer portion of the driving shaft which carries the tight and loose pulleys—is connected to the driving shaft proper by a flange coupling. By removing this countershaft, and the outer bearing, a motor may be mounted on a plate bolted to the sub-base, as shown in the illustration. The rotor shaft of the motor is connected to the driving shaft by means of a flexible coupling. Thus the necessity of mounting the motor on a side bracket, and driving the shaft through sprockets and chain is eliminated. The direct connection with the driving shaft does away with all lost motion and friction incidental to the old type, reduces the number of wearing parts, and produces a more compact and efficient machine. Also the interchangeable feature may appeal to those who contemplate a change to motor driven machinery at some future time.

The design and construction of the whole machine is such as makes it suitable for heavy grinding operations. The 53 in. disc wheel is carried on a spindle 3⅝ in. diameter, and is supported by a heavy cast iron flange, 20 in. diameter by 1⅜ in. thick. The spindle is mounted in two self-aligning radial ball bearings and the end thrust is taken on an exceptionally heavy thrust bearing, the balls of which are 1⅛ in. diameter. The equipment has been made ball bearing throughout, being a complete change from the old type and one which insures smooth running qualities and a marked saving in power. The spindle has a speed of 500 rev. per min., and is driven by means of a pair of hardened steel bevel gears, having a ratio of 2.4 to 1. These gears are enclosed in a dust protected housing and provision is made for ample lubrication. The entire weight of this equipment is 4,600 pounds.



MOTOR-DRIVEN, BALL-BEARING VERTICAL DISC GRINDER.

DRUM REVERSE SWITCH

ONE of the latest products of the Westinghouse Electric & Mfg. Co. is a small drum reverse switch (Type 810), for operating motors in machine tool, woodworking and other services requiring reversing of the motors. The small size and neat appearance of this reverse switch make it especially adapted for mounting directly on the machine. Not withstanding its small size this switch is exceptionally rugged and has proven successful on the most severe services.

A terminal board of heavy micarta forms the back of the switch, and on the front side of this board are mounted the stationary contracts. The movable contacts are mounted on cast brass brackets clamped on the shaft, from which they are thoroughly insulated. Good contact is insured by phosphor-bronze springs, on the movable contacts, these being protected by copper shunts.

DRUM REVERSE SWITCH SUITED FOR MOUNTING DIRECTLY ON MACHINES.

Heavy barriers of asbestos lumber separate adjacent sets of contacts so that cross-arcing is impossible. All live parts are protected from exposure by an enclosing cover of sheet steel, lined with asbestos, and held in place by two ring latches, which permit its easy removal for inspection or renewal of contacts.

These switches are made for alternating-current or direct-current circuits. For alternating-current service and for direct-current service without dynamic braking, they are provided with "Forward," "Off" and "Reverse" positions. For alternating-current service the

WITH COVER REMOVED AND CONSTRUCTION EXPOSED

and "Reverse." They may be used with automatic starters for shunt and compound-wound motors. With compound-wound motors having heavy series winding for tail-stock and cross-rail service, they may be used to connect the motor directly to the line, either with or without resistors permanently connected in series with the armature.

When remote mechanical control is desirable, both alternating-current and direct-current switches can be furnished with extended shaft, permitting either gear or sprocket operation.

AUTOMATIC SURFACE GRINDER

THE machine illustrated herewith has recently been developed and brought out by the Noble & Westbrook Mfg. Co., of Hartford, Conn. It is especially adapted for grinding flat surfaces where accuracy is required, and thoroughly modern in every detail. It is constructed with the best material and workmanship, all working parts being dust-proof. The device for raising and lowering the table is equipped with thrust ball bearings. The feed is graduated to thousandths and all slides and spindles have takeup bearings.

The cross slide is equipped with automatic stop, insuring safety both ways. The platen can be started or stopped instantly by use of hand lever at any desired position without stopping the spindle or other parts of the machine.

Capacity of machine, 8 in. x 20 in.; distance between bottom of 12 in. emery wheel and top platen, 7½ in.; size of spindle, 1 9-16 in. dia.; size of spindle between flanges, 1¼ in. dia.; size of emery wheel, 12 in. x ¾ in. dia.; size of bearings, 1 9-16 in. x 6 in.; size of counter drive pulley, 18 in. x 4 in. x 1⅝ in.; size of counter tight and loose pulley, 7 in. x 4 in. x 1¾ in.; steel self-oiling hangers are regularly supplied and the machine can be furnished with or without magnetic chuck.

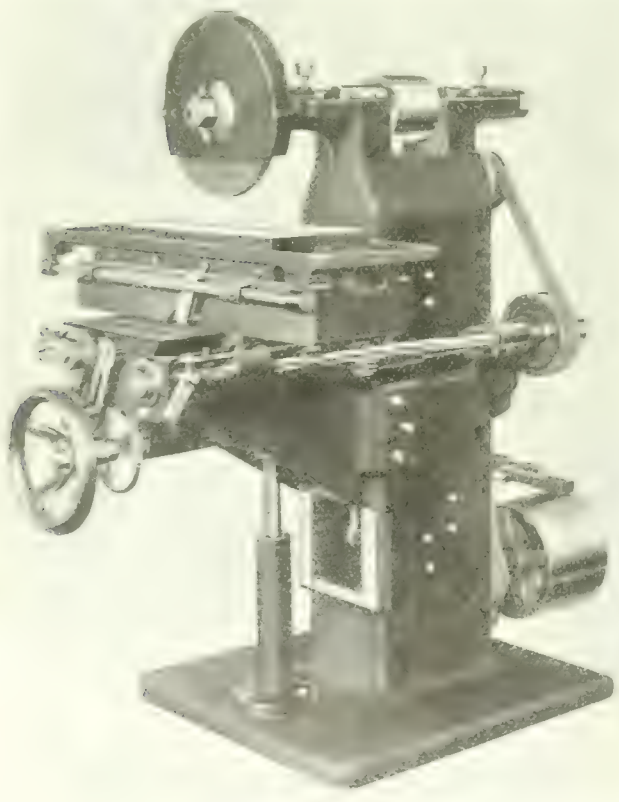
ADJUSTABLE SPEED MOTORS

PAST applications of interpole motors to machine tool operation have made apparent the limitations of this type of motor and suggested changes in design wherein the operating characteristics might be further improved. The principal factor in these limitations is the distortion by the armature reaction of the flux distribution in the main air gap. The amount of this distortion is dependent upon the relative values of the armature and field magnetizing forces, and is, therefore, greatest when the motor is operating at high speed or weak field. This distortion is effective in producing instability, poor commutation, high voltage between adjacent commutator segments and large load losses at weak field.

A commutating pole motor, in which this undesirable field distortion is to a large extent eliminated, has been designed and produced by the General Electric Co., Schenectady, N.Y., and is marketed in Canada by the Canadian General Electric Co. The principle is to distribute the compensating winding instead of concentrating it at the pole faces of the commutating poles, the magnetizing strength of the distributed winding being equal and opposite in direction to the magnetizing force of the armature.

Commutating Advantages

The design of the type R.F. motor, as it is styled, further provides a concentrated commutating winding, the effect of which is to widen the neutral or commutating zone and so insure sparkless commutation over the entire speed range of the motor. This makes for freedom from commutator troubles under the most severe conditions of service and considerably simplifies the control and protective apparatus required when applied to machine tool operation. Therefore, for ordinary classes of work, such as driving shapers, slotters, lathes, etc., a simple type of drum controller can be used, allowing the operator full control of starting, stopping, reversing and speed of the motor by means of a single



AUTOMATIC SURFACE GRINDER.

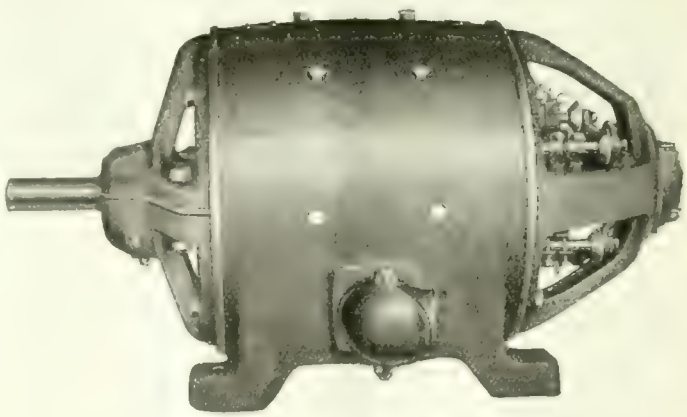


FIG. 1—MOTOR WITH OPEN END SHIELD

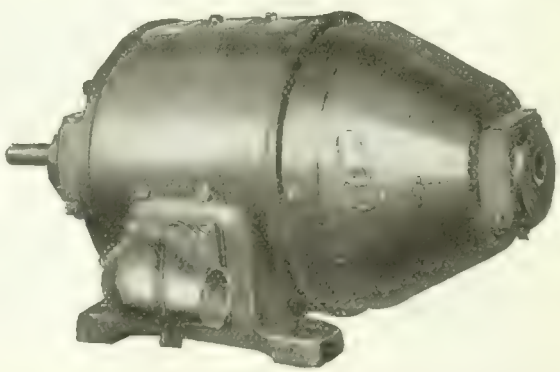


FIG. 2—ENCLOSED VENTILATING TYPE.

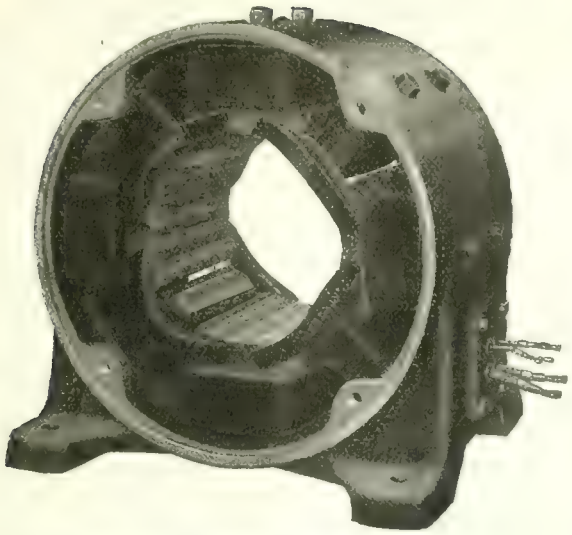


FIG. 3. MAGNET FRAME SHOWING CONSTRUCTION AND ARRANGEMENT OF POLE PIECES.

handle. It also provides a design of motor with which, for such service as planer operation, pipe threading, tapping, vertical slotting, or for driving any machine, in which the machine itself may automatically repeat its cycle of operation, magnetic control of a very much simpler type than that used with the conventional commutating pole type of motor can be employed without sacrificing excellence of commutation. The current peaks, even under abnormal operating conditions, are limited by the inherent characteristics of the motor itself. This motor may be accelerated from low speed to high speed, when connected to a friction load corresponding to rated output at high speed, by inserting total field resistance in one step. The current taken from the line under this condition will be well within the ordinary setting of protective devices.

The motor is rated on a basis of the allowable heating in a two-hours' continuous load at full field speed, its heating under this condition being assumed as equivalent to that attained by the motor under all day load conditions in actual service. The main field coils, as shown in Figs. 3 and 4, are so designed as to withstand without injury full potential continuously with the armature at rest. This insures low temperature rise in field coils under all day operation of the motor with the armature running, and in addition protects the motor against injury when the careless workman inadvertently leaves his work with the line switch closed and the motor at rest.

The construction of the motor is in keeping with the service conditions, the diameter of the armature being kept as small as possible to diminish its flywheel effect, and the frame, end shield and housing assembly being conspicuously rugged and compact. The arrangement of the compensating coils on the laminated poles is shown in Fig. 5, and the method of bolting the poles to the magnet frame in Fig. 3.

It is often desirable to protect the motor from chips, flying particles, etc. This can best be done by equipping the motor either before or after installation with a set of either perforated or solid metal covers, divided in halves so that the top half or all the opening may be enclosed. In the majority of cases the top set of covers will provide ample protection and not cause sufficient extra heating to affect the rating. However, if the machine is completely enclosed, as in Fig. 2, an air pipe connection for forced ventilation should be provided if the motor is to run at normal rating.

FIG. 4—SHUNT FIELD COIL ON ALUMINUM, ALSO INTERPOLE COIL.

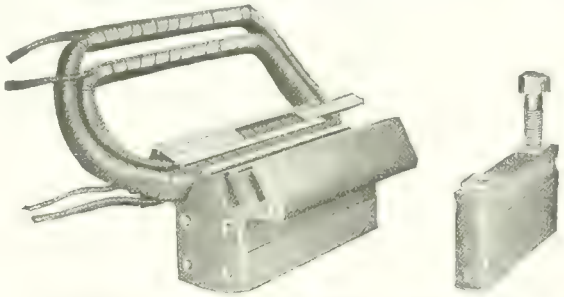


FIG. 5. LAMINATED MAIN POLE AND INTERPOLE WITH COMPENSATING COILS IN PLACE.

STEEL FAMINE FEARED IN BRAZIL

UNITED STATES Consul General Gotschalk, at Rio de Janeiro, reports that interviews with several iron and steel importers of Rio de Janeiro disclose a general belief on the part of the best informed among them that within four or five months there will be a complete famine of structural iron and steel and of iron and steel goods generally in that city. Several of the more careful of these importers are quietly buying up all the old iron and steel they can find, with a view to facing this expected situation. It is interesting in this connection to observe that there is a noticeable revival of interests in certain projects which have been for a long time under consideration to establish a domestic steel industry.

A representative of an American concern recently arrived at Rio de Janerio, bringing with him machinery that had been ordered by the Government-owned Central Railroad of Brazil for a large steel plant to be erected at some point on the lines of the railroad.

TITANIUM.

TITANIUM is metallurgically somewhat in the position which aluminum occupied forty years ago. Very widely distributed, though not generally in large deposits, titanium might be utilized in various ways if the smelting difficulties could be overcome. Chemically titanium stands between carbon and silicon on the one side, and zirconium and the rare earths on the other. It occurs mostly as oxide, TiO_2, alone as rutile, or associated with iron as ilmenite, $FeO.TiO_2$. The chief European deposit is at Kragero, in Norway; very large deposits of ilmenite are found in the Quebec Province (near Rapid River and Saguenay River), in the United States, India, Ceylon, Nigeria, Queensland and South Australia. The titaniferous iron-sands abounding on the shores of Taranaki Bay, New Zealand, first attracted attention in the British Colonies; but they are unsuitable for the blast-furnace, and even the quite recent attempts at briquetting the ore and smelting it in electric and other furnaces have hardly been successful so far, as we see from the Bulletin of the Imperial Institute, vol. XV., No. 1, 1917, which contains a very instructive article on "The Distribution and Uses of Titanium Ores," amply stocked with references. The pig-iron from the titaniferous sands is too rich in phosphorus and sulphur. Earlier attempts made at Norton, in England, to smelt titaniferous iron ores were given up, owing to the pasty condition of the slag and the uncertainty of the ore supply. That uncertainty does not exist at Sanford Hill, in the Adirondacks (New York) and in the Iron Mountains of Wyoming; but the smelting is not prospering, and the replacement of the silicon in the iron by titanium is not liked. Yet rail steel is notoriously improved as to strength and abrasive resistance when about 1.7 lb. of titanium (as iron alloy) is added in the ladle per ton of steel; and ferro-titanium was much used for this purpose in the days of Bessemer steel, though the metal had to be reduced by the aid of aluminum. The action of titanium, which binds the nitrogen in iron to a nitride, is said to be less marked with open-hearth steel; but basic steel has been improved in this way at Osnabrück, at any rate. T

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VICTORY FIRST, THEN—?

TO those who have listened to the appeals and exhortations from workers for the Victory Loan during the past few weeks, who have noted the presence in their midst of men prominent in the industrial world, who have studied the statements and weighed the remarks of those men with more than ordinary care and deliberation, one feature stands out above all other considerations and that is the unredeemable debt which every living soul in this country owes to each man and boy, yes and woman too, who have gone forth at the call of duty, and in many cases fulfilled it to the last.

Business men, manufacturers and others who could have stood back have gone amongst their workers and friends, and by virtue of their very earnestness and sincerity have influenced the indifferent and strengthened the willing to insure to the greatest possible extent the overwhelming success of Canada's Victory Loan.

Apart, however, from the sentiment of the situation and the disastrous effects which would have resulted had failure attended their efforts—a catastrophe which we now know is impossible—one feature which was given considerable prominence and which impressed many hearers hitherto unacquainted with it was the tremendous wealth of the Dominion in natural resources. To fully expound this phase of the country's effort would tax the powers of any student of political economy, but its true perspective at the moment can be faintly realized if one considers for a moment just how much visible wealth there is now in this country, both individual and corporate, and that such wealth, in case of emergency, would become national.

The immense sum represented by this is the result of approximately only half a century's development and is therefore but a fraction of what will be in existence in the next half century, yet all this that we call wealth is but evidence, some of it tangible, some of it intangible, of the value of this part of the North American continent as a habitation for mankind.

Rigours of climate, variations in the financial, industrial and economic life of the nation, all the trials which greater nations have gone through before us—these are part of our natural heritage, but they are ours to be overcome, not to be avoided.

Looking back over the past three years, can anyone say we are less great in any one respect, all circumstances considered, than we were three years ago? And in view of what has been accomplished during these and many previous years, can anyone say that we shall not accomplish many times as much in the immediate and not far distant future? And even then, if we can only realize it, the natural resources of our country will have been but scratched.

Considerations such as these are what strengthened our industrial leaders in their appeal to the public, and enabled them to place beyond all human doubt the question of security.

A point, however, which was untouched was the influence which such a loan, subscribed to in such a manner, must, in the aggregate, exert on all those who participate.

A plain realization by the worker, mill operative, factory hand and transportation worker whose efforts are directly connected with the expenditure of the loan, will make it apparent to him or her that any lack of efficiency by any individual means the loss of so much money,—money which has come out of their own and their neighbor's pocket. The textile worker who spoils a blanket or length of cloth, the shoe maker who scraps a pair of boots, the munition worker who spoils a shell, all through carelessness and lack of attention,—each one of these must feel that they have not only lost money for their country but for themselves.

Every ton of fuel consumed unnecessarily in steel making or transportation, every square foot of ship plate not utilized to the best advantage, every hour not spent in intense production means the nullification of so many dollars, dollars saved through years of economy and which must be repaid ultimately out of our natural wealth.

Our natural wealth! The very vastness of it staggers the mind and makes the dollar seem atomic in its smallness and yet in the same breath we are told that every dollar counts. And it is true.

While in some respects our country has been blessed through the absence of war's terrors, the fact of such immunity may be ultimately a handicap which will demand increased effort on our part to overcome. The demands of war have been felt most intensely and insistently in Britain and France, and later in the United States. The former countries, however, by reason of their previous dependency on Germany for many essential materials, were called upon to make efforts beyond comprehension at this distance, efforts which have resulted in many industrial developments that ultimately will more than compensate for the present strenuous times.

It is here that we, with our latent potentialities, must be fully alive and awake to the probabilities of the future. Much is said of our enormous water power resources, but when munitions and stores of war vanish from the factories, when nations cry aloud for the necessities of life, when efforts to make the world a place to live in are resumed on an unprecedented scale, shall we be willing and able to apply that wealth which is our present strength to the amelioration of the lot of those of our brethren whose bravery and sacrifice has been our present protection?

It is there that our future duty lies, not scarred with battle and torn with strife, but clothed with humble reward and a due appreciation of our debt to others. While our men and dollars are fighting let not our brains slumber. The race will be to the swift even as the fight is now to the strong.

INDUSTRIAL NOTABILITIES

LIEUT.-COL. CHARLES N. MONSARRAT, civil engineer, chairman and chief engineer of Board of Engineers appointed by Dominion Government to reconstruct the Quebec Bridge, was born in Montreal, July 2, 1871, son of the late Mark R. Monsarrat, of the Bank of Montreal, and Mary Monsarrat.

He commenced his career as a draughtsman with the Canadian Pacific Railway, Montreal, in 1890, becoming assistant engineer C.P.R., Montreal, 1895, and engineer of bridges C.P.R., Montreal, 1903, which post he filled some eight years before his appointment by the Government.

LIEUT.-COL. CHARLES N. MONSARRAT

As engineer of bridges he was responsible for the designing, construction and erection of all structures on the line of the C.P.R. from Jan. 1, 1903, to May 1, 1911, notable among which were French River Bridge, Lethbridge Viaduct, 5,327 feet long and 300 feet high; Edmonton High Level Bridge, St. Lawrence River Bridge at Lachine, Que.; St. Anne's and Vaudreuil bridges, replacement of Fraser River Cantilever Bridge and numerous other important structures.

Col. Monsarrat, as chairman and chief engineer of the Board of Engineers appointed by the Dominion Government to reconstruct the Quebec Bridge, was responsible to the Government for the specifications, designing, fabrication and erection of this bridge, including foundations, masonry and superstructure.

Lt.-Col. Monsarrat takes a keen interest in military as well as technical matters, having advanced in rank from lieutenant to officer commanding the 5th Royal Highlanders of Canada, and his societies include the Canadian Society of Civil Engineers; American Society of Civil Engineers; Railway Engineers' Association.

He married Mary Alice Foster, daughter of the late Robert Foster, Feb. 9, 1898, their family consisting of one son and one daughter.

His Clubs are: St. James'; Montreal Hunt; Beaconsfield Golf; Outremont Golf; and in creed he is Anglican.

The residence is 4189 Sherbrooke St. West, Montreal.

Photo, courtesy British & Colonial Press

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Hamilton	50 00
Victoria	50 00

FINISHED IRON AND STEEL

Steel bars, base, Toronto	5 50
Spring steel	7 00
Chequered floor plate, ¼ in.	13 00
Structural shapes	5 00

F.O.B. Chicago Warehouse

*Government prices.

FREIGHT RATES

Pittsburgh to Ontario Points

	Per 100 lbs. C.L.	L.C.L.
St. John, N.B.	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Castings, copper	32 00	31 00
Spelter	10 50	10 50
Lead	9 50	8 50

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Black Galvanized
Standard Buttweld

Size	Per 100 feet	
1¼ in.	16 33	20 59
2 in.	26 27	33 12
3 in.	55 08	69 23
6 in.	145 90	183 36
8 in.	230 40	288 00
10 L in.	256 00	320 00
4½ ins.	71 76	89 70

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 15%.

4½" and larger, 10%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 15%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	11 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Machine shop turnings	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Pipe lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less..	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above..	8 40
Wood screws, flat head	27½
Wood screws, O. & R.	47½
Wood screws, flat head, brass	32½
Wood screws, O. & R., brass	47½

MILLED PRODUCTS

	Per cent.
Set screws	20
Fin. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat Sq. But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ¾ in. and larger		$7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Pumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill list plus 40%

At warehouse list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 00
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 20
Premier, 10¾ oz.	13 85	10 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

¼ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	10
Black Diamond	10
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	10
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5
Standard	10%
Cut leather lacing, No. 1	1 90
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jap. Steel Tape, 50 ft.	3 00

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11½
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	10%
Best grades	20

ANODES.

Nickel	.50 to .61
Cobalt	1.75 to 2.00
Copper	.41 to .46
Tin	.40 to .50
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x 25 in., 14x60 in.	55 00	53 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	58 00
Copper sheet, planished, 14x60 base	64 00	60 00
Brazed ¾ in. sheets, 9 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 67
Copper tubing, seamless	0 55

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, jeweler	30 to 50

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	15
Acid, hydrochloric	05
Acid, hydrofluoric	11½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.2
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Machine Tool Trade Benefits From Renewed Munitions Activity—Metal Prices Firm—Coke Scarce

THERE have been no further developments this week in regard to shell orders, but further contracts will likely be placed in due course. The revival in the munitions industry has caused great satisfaction and a large number of plants will continue to be engaged in this work. The machine tool business has already derived considerable benefit from this activity, particularly firms making special equipment. There is also a fair demand for machine tools for general purposes. The principal feature in the iron and steel market is the shortage of material for commercial purposes due to the heavy and increased demand for steel for munitions and war equipment generally. The situation in this respect appears likely to become more acute as time passes. The steel mills are behind on deliveries in spite of extraordinary efforts which have been made to meet the demand and the requirements are all the time increasing. The position of the private consumer is steadily getting worse and manufacturing activities are being restricted on account of the scarcity of iron and steel. Prices of steel products continue firm and unchanged. There is as yet no indication of a general recession in prices in spite of the lower tendency in the States. It is likely that the law of supply and demand will control the situation and keep prices up. Pig-iron prices unchanged and firm. The shortage of coke is becoming more acute due to the congestion of freight on the railways in the States and the production of steel is already being affected. A sharp advance in tin is the principal feature in the non-ferrous metal market, and is due to a serious shortage of spot metal. Prices of all other metals are firm and unchanged.

MONTREAL, Que., Nov. 26, 1917.—Industrial interest has again been revived by the renewal activity that is promised in munitions circles by placing of extensive business from States for 75 mm. shells. It is not anticipated that activities will be spread over such an area as characterized the production of the British shells, as the contracts have only been allotted to such firms as were reasonably well equipped to guarantee delivery within a specified time. Several firms are now actively engaged in arranging their plants, and manufacturing operations will be commenced in a very short time; one Montreal firm expects to be making 10,000 of these shells per day by the first of the year. In all probability additional orders will be placed for more British shells in the near future. The early closing of navigation will result in added pressure on railroad transportation, a factor that is generally a serious one during the winter, even in normal times.

Pig Iron

No marked change has taken place in the general situation here although the market in Canadian pig is less acute and there is apparently some indication that a surplus of home production may soon be available for domestic use. The American shortage has now become additionally emphasized owing to the inability of the smelters to secure sufficient raw materials to operate their plants at

capacity. [illegible] products at the present time is exceedingly large owing to the [illegible] requirements for war purposes. A [illegible] are now controlled by the United States Government, but few [illegible] made on the same [illegible] prevailing.

Steel

No [illegible] ufacturing and shipbuilding purposes. [illegible] placed on the export of steel from Canada will have little effect on existing conditions, as practically no material of an essential character has been leaving the country for the past two years or [illegible] facturers are confronted with at the present time is the inability to secure much required supplies of steel from the States, owing to the abnormal demand for this class of material for local use.

A feature that tends to dislocate the trade at [illegible] is the fact that production is to a large extent is governed by the regulations that are now in force, often preventing mills operating at their maximum capacity, owing to the shifting of current requirements. Nearly all the leading lines of steel, both unfinished and manufactured, are now selling at the price as set by the Government, or where the prices have been voluntarily adjusted by the individual manufacturers. Further adjustments have been made during the past week relative to the price on iron at Philadelphia and New York, the respective quotations being 3.685 and 3.695 cents per lb. Steel hoops, Pittsburgh, are now quoted at 3½ cents, a decline on the most recent open quotation of 2 cents per lb. The recognized adjusted price on cold rolled strip steel is now 6½ cents, a drop of one cent on the open market price.

Local dealers still complain of the scarcity of certain classes of steel, more particularly plates for shipbuilding and general manufacturing purposes. It is understood that the material required for the production of the American shells here will be shipped in from the States in sufficient volume for the maximum amount of shells that the various plants can produce. The partial return to former activity in the shellmaking industry has increased the demand for high speed steel, which for some time back has shown a marked decline; quotations on this class of steel however are well maintained, the prices ruling being from $2.25 to $2.75 per lb. Conditions generally are unchanged and all steel quotations are nominally the same as those quoted last week.

Metals

With the exception of tin, the metal market generally is characterized by marked inactivity. The entire situation is influenced by the prevailing conditions in the States and the market continues to be an unsettled one. Copper is quiet but recent action on the part of the Government promises an early change. Tin has been the feature of the market and is exceptionally strong. Spelter is unsettled and quiet. Lead is quiet after recent activity. Antimony and aluminum are quiet but fairly firm.

Copper.—A slightly easier position has been given to the copper situation by the recent announcement of the American Government to the effect that jobbers will be allowed a commission of 5 per cent. for their efforts in handling the metal. This may give some relief to a situation that has been more or less marked by the absolute control of the producers, as the new regulations will enable the small dealers to take a more active interest in the market. Local dealers report a little stronger market, prices having been advanced ½ cent during the week, current quotations being 33 cents for lake and electro, and 32 cents for castings.

Tin.—The present high market has been the result of the scarcity of metal rather than the heavy consumption, the inability to obtain shipping permits being the main cause of the acute conditions. It had been generally expected that in the program of the regulation of prices of the various war materials, negotiation would be successfully consummated with the British authorities whereby sufficient tin would be forthcoming to supply all the requirements for war purposes, both directly and indirectly. It is, however, hoped that immediate steps will be taken to furnish relief to tin situation here and in the States; but conditions are such that some time must necessarily elapse before any relief would be apparent, owing to the disorganized state of the present market. New York is now quoting the record price of 80 cents, and even this quotation is only nominal, as little metal is available at the above price. The local quotation is nominal at 71½ cents, with dealers looking for still higher prices.

Spelter.—The market is still somewhat unsettled owing to the doubt existing as to the intentions of the American Government respecting the prices that are to govern the sale of this metal. New York quotations are a little weaker, but local dealers are holding firm at the quotation of 10½ cents per lb.

Lead.—This metal is less active than it has been for some time, as many of the large consumers are well covered for their early future requirements. The strength of the market is however well maintained and quotations are very firm. A difference of ⅜ cent per lb. exists between the quotations of the leading interests and the independents, the former being the easier at 6¼ cents per lb. Local dealers report a quiet but steady market with prices unchanged at 9½ cents per lb.

Antimony.—The activity of the market is quite normal with no features of importance to note. The New York situation has an undertone of strength; the situation here is unchanged with quotations firm at 17 cents per lb.

Aluminum.—The market is featureless on quiet demand and prices locally are unchanged but firm at 60 cents per lb.

Machine Tools and Supplies

Machine tool activity has shown considerable improvement since the placing of orders for American shells. Contracts accepted by Canadian firms call for maximum production and delivery within a specified time, and only those plants that can reasonably guarantee the output have been fortunate enough to obtain orders. This recent development in the shell industry has revived the waning interest of machine tool makers and dealers, and inquiries for equipment are of a very encouraging character, but where machines are required to be brought in from the States the dealers and manufacturers find it increasingly difficult to obtain delivery owing to the conditions that dominate the situation in the States.

The abnormal demands of the American Government for war necessities has almost confined the selling of machinery to war essentials, so that equipment for general domestic purposes or even war requirements of less importance is receiving very little consideration at the present time. In addition to the business that is now being placed from American sources, there is a probability that further contracts for British munitions may result from the appropriation of a certain percentage of the Victory Loan for war necessities. The sale of equipment for general purposes is of fair volume and on the whole present activity is better that it has been for several months. The demand for supplies, that for some time has not been very active, has received impetus from the acknowledged activity in other directions. Imported supplies however are still hard to obtain owing to the demand in the States.

Scrap

The apparent shortage of visible supplies of scrap has assisted in maintaining a firm market, although the general situation continues to be more or less unsettled due to the uncertainty that characterizes scrap trading. The New York situation has shown small fluctuations and is generally firm. Conditions here are firm but dealers report a certain nervousness that may react in either direction; prices are comparatively firm.

Toronto

TORONTO, Ont., Nov. 27.—The munitions business is adding its quota to the continued improvement in trade in this country, and the amount of money involved is greater than in any other industry. The large expenditure of money during the coming months will assist materially in maintaining a condition of prosperity in Canada. For the first six months of the fiscal year ending with October, the increase in trade was ap-

proximately $273,000,000. For the seven months the trade in the Dominion reached a total of $1,586,616,258, as compared with $1,313,189,951 for the corresponding period last year. For the month of October alone Canada's trade amounted to $238,834,321, as against $164,330,179 for the corresponding month in 1916. Manufactured goods to the value of $420,380,372 were exported, a big increase as compared with last year, when domestic manufactures to the value of $219,461,054 were shipped out of the country.

Steel

Nothing of particular importance has occurred during the week to materially change the situation in the steel industry. Artificial conditions, due to embargoes and fixed prices, have created an unusual situation in the steel trade, and one that will incline to dullness. Owing to the abnormal conditions prevailing, business has been somewhat disorganized and consumers of necessity have to be cautious in buying. Both merchants' and consumers' stocks are now very low and buying is of the hand-to-mouth order. This situation has been brought about by an extended period of high prices and more recently by the shortage of materials. Merchants say that inquiries are coming in freely, but that they cannot meet the demand owing to sold-up condition at the mills and resultant backward deliveries. The enormous demand for steel for war purposes precludes the possibility of any improvement in the situation for some time to come.

That the shortage of steel for commercial purposes will become more acute seems inevitable on account of the growing demand for war purposes. Manufacturing operations are being curtailed, and will continue to be so as long as present conditions prevail. Unfortunately there are no indications of any material improvement in the situation in spite of the embargo which has been placed on the export of steel from Canada. While the embargo will afford some relief, this will be largely offset by the difficulty in obtaining steel from the States for commercial purposes. One satisfactory feature of the situation is the steady increase in output of the Canadian steel mills. A statement recently issued by the Lake Superior Corporation covering the four months ending October 31 shows steel tonnage production of 165,477 tons of ingots, against 131,572 tons for the corresponding period last year, representing an increase in output of 33,905 tons. The unfilled orders on the above date were approximately 380,000 tons, which is equivalent to practically nine months' production. The shell orders which, it is expected, will be placed in the near future will require a large tonnage of steel, and will keep the mills operating at capacity for several months, with due allowance for labor shortage and climatic drawback expected in the winter season.

There have been no further price changes made during the week, and, with few exceptions in this respect, the market is firm. It is generally believed that prices in the United States of steel for commercial purposes will be a little above the prices agreed upon for Government work. It is not clear even yet what effect this price regulation in the States will have on the situation in Canada. Up to the present time prices, with very few exceptions, have not declined, and there has been nothing to indicate that there would be a general recession. It is not at all improbable that the law of supply and demand will continue to control the market to a considerable extent in spite of the price-fixing regulations, that is in so far as private consumers are concerned. The mills in the States have been operating at full capacity for months, and still the demand has not been met. During the past seven or eight months the demand has increased greatly, and it now remains to be seen what tonnage of iron and steel will be available for domestic consumption. Government orders must be filled first and what remains will be sold to private consumers. Under these conditions it is difficult to see how prices can be materially reduced.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Pig Iron

The situation in the Canadian pig iron market is unchanged and prices continue to be quoted on the basis as given last week. The coke situation, however, is causing much anxiety to furnaces in this province on account of a serious shortage in the States. The majority of blast furnace interests across the line are losing production and a number of furnaces have been banked pending an increase in coke supply. The reason for the trouble is a congestion of freight traffic on the railways. The situation in the States as to supplies of steel-making iron, particularly basic, is daily growing more acute and threatens to curtail the production of steel. There is also a continued scarcity of foundry coke, as coke producers are giving preference to furnace coke as against foundry coke.

Scrap

The scrap market continues stagnant and prices unchanged, but with a weaker tendency. Consumers continue to keep out of the market, as they anticipate lower prices, while dealers on the other hand look for an increase in values. Conditions prevailing in the market here are due to the unsettled situation in the States.

Machine Tools

The machine tool market continues active, due to the increased demand for equipment for munition plants. Special tools for shell work are in good demand, and trade generally is better than it has been for some months. A number of inquiries have been received by local machinery houses for used equipment for shell plants, while the demand for tools for general purposes is fairly active. War requirements dominate the machine tool market in the States, and it is now very difficult to obtain equipment in that country for shipment to Canada. Deliveries on most lines are more backward than ever, as the activity in the States is not confined to shell plants, but includes practically all industries.

Supplies

Business continues steady, with no feature of particular importance to note. Prices on practically all lines are well maintained, with an upward tendency in some cases. Stocks on hand are comparatively light, as some lines are difficult to obtain, deliveries being backward.

Metals

Another sharp advance in the price of tin is the chief feature of importance to note this week. There is an acute shortage of tin in New York, but hopes are entertained that some relief will be obtained in the near future. The copper situation is unchanged, the distribution of this metal being under Government control. Both lead and spelter are firmer, but quotations are unchanged. Antimony and aluminum are also quoted on the basis of last week's prices.

Copper.—The position of copper is unchanged in the primary market and no material change in the situation is expected as the market is under government control. An important matter has been settled by the Copper Producers' Committee, by allowing copper dealers to charge buyers a commission of 5 per cent. which is equivalent to a profit of 1¼c per pound, that is, they can sell at 24¾c per pound. The local situation is unchanged. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—The acute shortage of tin in New York and sharp advance in price has been reflected locally and this metal is now being quoted at 80c per pound. The Tin Committee in New York are endeavoring to make some arrangement for the distribution of tin which it is hoped may lead to a more liberal allotment for the United States. No immediate improvement in the situation is expected. Tin is now quoted nominally 80c per pound.

Spelter.—The tone of the market is firmer with a better demand, although there is some uncertainty in the primary market in regard to the favorable outcome of the Government price fixing regulations. Spelter is unchanged locally at 10½c per pound.

Lead.—The market is firmer on bet-

tive demand and the price is continued. An improvement in the lead situation is possible on account of the increased activity in the munitions industry. Lead is quoted locally at 8½c per pound.

Antimony—The position of antimony is unchanged. The market is quiet with nothing doing. Quotation is 16c per pound.

Aluminum—A shortage in aluminum is feared as a number of these factories are being turned over to the manufacture of war equipment. The market is firm and unchanged at 60c per pound.

Washington

WASHINGTON, D.C., Nov. 24.—The United States Shipping Board has now passed through the second organization since Admiral W. L. Capps, general manager of the Emergency Fleet Corporation, has asked to be relieved of all duty on account of ill health. Rear Admiral A. W. Bowles, who has been assistant to Admiral Capps, will undoubtedly leave the Shipping Board. Despite the fact that Admiral Capps pleads ill health, it is an open secret in Washington for two weeks he has been without authority, although still retaining the title of general manager of the Emergency Fleet Corporation. The appointment of Charles A. Piez as vice-president of the Emergency Fleet Corporation robbed Admiral Capps of his power. Full authority was vested in Piez by the members of the Shipping Board and Capps was given jurisdiction only over matters of construction.

Admiral Capps has rendered a great service to the shipping programme of the United States. After the removal of General George Goethals as manager of the Fleet Corporation, Admiral Capps took up the work and really started the programme on its way. His hard labor at that time has broken down his health and made him unable to keep pace with the rapid movements, hence the appointment of Piez and the gradual loss of power by Capps.

Construction in 1918

Chairman Hurley of the Shipping Board has denied that the Board has promised 6,000,000 tons of ship construction during 1918. "We will do everything possible of course," Mr. Hurley declares, "but I will make no promise at this time." He announced that up to the present time 159,299 tons of bottoms under construction for foreign owners on American ways have been completed and commandeered by the Shipping Board. The first steel vessel of the new construction programme was launched November 24 at the Skinner-Eddy yards in Seattle, Wash.

To man the vessels of the United States Shipping Board a recruiting campaign has been set under way. One hundred thousand men are needed.

The Interstate Commerce Commission has set December 7 as the date when the four large American express companies will be given a hearing on their petition for a general increase of ten per cent. on all rates. These increases also include the rates between the United States and Canada.

U.S. Navy Requirements

The Bureau of Supplies and Accounts of the United States Navy Department has issued notice of proposed purchases of the following materials:—Heavy duty engine lathe; machine, boring and drilling, horizontal; machine, type testing, 300,000 pounds; planer and joiner, electrically driven; screws, machine, iron, round head; screws, machine, brass, flat head. Bidders desiring to submit proposals should write to the Bureau of Supplies and Accounts, Navy Department, Washington, D.C., asking for schedules 1569, 1567, 1568, and 1566.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Curtailment of Non-Essential Industries

Great unrest has been caused in the manufacturing circles of the United States by reports of governmental curtailment of non-essential industries. In order to set the minds of manufacturers at rest, Judge Robert S. Lovett of the Priority Board has issued formal notice that he does not at the present time contemplate any further issuance of priority orders with respect to transportation facilities for non-essentials. It is known that the curtailment of non-essentials will be practiced by the Government by cutting off supplies of coal and raw materials. This curtailment will be gradual however, and there will be no general order issued against non-essential industries. Factories making non-war goods will be dealt with individually and will be given an opportunity for a hearing before action is taken against them.

Fuel Situation

The United States Fuel Administration has lifted the priority order given to coal for the Great Lakes and Northwest, effective Nov. 30. It is maintained that there is sufficient supply in these districts now and that the New England territory must be taken care of. The Fuel Administration has set the following prices for coke:—By-product coke, run of ovens, $6 a ton; selected foundry, $7; crushed over 1-inch size, $6.50. The maximum price fixed for gas coke shall be the same as the maximum price fixed for anthracite coal in the same locality.

Conservation of Labor

The Ordnance Bureau of the War Department has issued a long statement to munitions manufacturers, working on Government contracts calling upon them to safeguard labor in all possible ways. The eight hour day is suggested, with time and one half for overtime, and half holidays on Saturdays. It is urged that every possible means be taken in order to maintain high standards of labor conditions and particular instructions are given for the protection of women in the war industries.

Daniel Willard, president of the Baltimore and Ohio railroad, has been named as chairman of the War Industries Board, succeeding Frank A. Scott, resigned. Willard is also a member of the Advisory Commission of the Council of National Defense and chairman of the committee on railroads of the Council. He is looked upon by manufacturers as a strong advocate of stern war measures. In public addresses he has expressed his opinion that all else must be subjugated to victory in the war, and for this reason leaders in war industries look for strict governmental supervision in the future.

Freight Congestion

In order to reduce the great freight congestion the Council of National Defense has named a Highways Transport Committee under Roy D. Chapin of the Hudson Motor Company. This committee will work out a system of short haul motor trucks lines to carry freight into terminal points. A transcontinental route is also being mapped out and 10,000 motor trucks to be manufactured in the middle west for use in France will be brought overland, with cargoes, to the seacoast.

Reports of the Department of Commerce show that imports into the United States from Canada, Mexico and Central America during the nine months ended September 30 were valued at $441,061,128 as against $483,895,646 in the same period in 1916.

In order to reduce the use of wool for civilian purposes, the Council of National Defence through the Commercial Economy Board has secured from the woolen manufacturers of the United States a voluntary agreement to reduce the amount of consumed wool from 30 to 40 per cent. during the next twelve months.

New York

NEW YORK, Nov. 24.—Great war orders calling for the expenditure of $250,000,000 by the United States Government have been placed in the last week. The largest single contract is for 40,000

trucks to be manufactured by the Continental Motors Corporation. It is understood that the contract price is not far from $150,000,000. These motors will be of a similar type to the Liberty motor that is designed for aircraft. The trucks are of two types. There will be 25,000 of type A, costing between $4,000 to $5,000 each, and 15,000 of type C, costing $3,500 to $4,000 each.

Large Forging Contracts Placed

Another huge contract is for forgings for the construction of battleships and torpedo boat destroyers. The contract was placed with the Pollak Steel Co. of Cincinnati, which will immediately make large extensions to its Queen City plant. The Ordnance Department has also placed a large contract with the same manufacturers for gun forgings and forgings for 9.5-in. projectiles. Recently the Pollak Co. also received an order from Great Britain for 1,000,000 forgings for 6-in. shell. The latter forgings will be machined by the Westinghouse Electric & Mfg. Co. The Pollak Co. has already fulfilled large contracts for forgings for Great Britain and for France.

Great Lakes Shipbuilding

The Emergency Fleet Corporation has given a $25,000,000 contract to the American Shipbuilding Co., which is to build thirty-six 3,500-ton ocean-going boats on the Great Lakes. Each boat will be 261 feet long and 43 feet beam.

The Groton Iron Works of New London, Conn., has been authorized by the United States Government to spend $3,000,000 to expand its plant in order to enable it to build steel and wooden merchant vessels for the Fleet Corporation. Large purchases of machine tools will be made to equip these shops.

The Singer Mfg. Co., which has a large Government contract for the manufacture of war munitions, has placed orders this week for the needed supplies, costing $20,000,000. The purchases have included 15,000 tons of pig iron as well as large amounts of copper and of rubber. This company's plant is already well equipped with machinery required for the manufacture of projectiles.

The War Department has decided to extend the Picatinny Arsenal, near Dover, N.J. Twenty 10-ton cranes have been purchased and large orders for machine tools will be placed next month for the new shops now under construction.

Machine Tools in Demand

There is great activity in the machinery industry in the interior, where manufacturers of war munitions are placing orders for shop equipment.

The Four Lakes Ordnance Co., Madison, in addition to buying $325,000 worth of machine tools, will build twenty large lathes of a special type required to manufacture three hundred 5-inch naval guns.

The International Harvester Co. has placed orders in Chicago for additional equipment for its Akron plant.

The American Brake Shoe & Foundry Co., which has a Government order for 6-inch shell, is now in the market for lathes to be installed in its Erie shops.

The F. B. Stearns Co., at Cleveland, manufacturing airplane motors, are buying 25 machines of various types.

The Snead & Co. Iron Works of Jersey City is buying tools to execute a shell order for one of the Allied Governments. Machine tool builders at Cincinnati are taking orders for equipping American repair shops in France. The United States Government has changed the shell contract recently awarded the International Arms & Fuse Corporation from 75 mm. to 6-inch projectiles.

Pittsburgh

PITTSBURGH, Pa., Nov. 24.—Were it not that there is a serious curtailment in the production of pig iron, due to an increased shortage of coke, it is probable that foundry iron would be more plentiful. The business of some foundries has greatly decreased on account of war conditions. One large interest, making goods used chiefly in building operations and normally consuming fully 50,000 tons of pig iron annually, is shipping practically nothing, has a stock of 20,000 tons of iron, and has instructed furnaces to suspend shipments of pig iron. One of its three plants is to be converted for shell manufacture.

Coke Situation Unsatisfactory

The coke situation is extremely unsatisfactory. All year the supplies from the Connellsville region have been poor, to such an extent that the country's pig iron production has fallen a trifle short of that in the corresponding period last year, when there are new furnaces sufficient to increase the production by between 5 and 10 per cent., while in the past fortnight the coke shipments have been still poorer. The majority of furnace interests have had to bank for longer or shorter periods during the past ten days. The result is that, while they had been making an earnest effort to make sales at the Government prices to regular customers, they have now had to withdraw from the market entirely, as they can hardly meet their contract requirements, and may have a worse time when winter weather arrives. It is estimated that one could readily sell 200,000 tons of steel-making pig iron to steel works in this vicinity for delivery up to April 1 if the iron could be furnished.

Railroad Congestion

Nearly all the railroad divisions in the Central West are congested, and in the case of some divisions handling chiefly coal and coke the congestion amounts to a blockade. No adequate relief is expected until the Washington authorities carry out the programme now being considered of curtailing activity in the industries deemed unessential to prosecution of the war. At the request of the authorities the railroads have compiled a list of 525 commodities which might be considered unessential, and some of these will probably be embargoed.

More Set Steel Prices

The American Iron and Steel Institute has made a further announcement as to iron and steel prices. Light rails, 25 to 45-lb., are set at 3c, or $67.20 per gross ton. Chain is set at 8c base for ⅜-inch proof coil chain. Cold rolled strip steel is set at 6.50c base. Some long lists of extras and differentials have been promulgated, including complete lists for small nails, brads, tacks, etc., as well as for wood screws.

More Steel in Market

Offerings of finished steel products for early deliveries have become somewhat more general, and regular customers of mills now find little difficulty in placing orders at the set prices against necessary requirements. While the mills in most cases are well sold up, the majority of them can furnish some additional steel to regular customers. The professional buyer or shopper still has his difficulties and is frequently forced to go to jobbers. The jobbers have been coming down to the set margins prescribed by the Institute, as detailed in last report, but a few have not yet completed the readjustment. In occasional instances warehouses operated by producers have quoted a few commodities, including bars, at less than the prescribed margin, but this practice seems to be exceptional.

Some nut and bolt makers have revised certain contracts to the set prices, having found that the contracts in question were not producing specifications, and specifications were needed. The average nut and bolt maker, however, claims he is sold up solidly for several weeks.

Conditions and Prospects

On the whole, the steel market presents a stronger aspect than it did a fortnight ago. During the progress of price fixing, now an accomplished fact as to nearly all commodities, the market turnover was very light and, while many observers attributed this condition to a sold-up or oversold condition of the mills, there really was much doubt as to whether the mills would have sufficient business to operate at capacity for more than a very few months. In the past fortnight, however, the commercial buying has been considerably heavier, and the Government requirements have been promising a larger tonnage. The mills now have more occasion for concern as to whether they will be able to maintain production in view of transportation difficulties and, to a lesser extent, labor shortage than occasion for concern as to whether they will receive orders.

Shell Steel Orders

The Government continue to place orders for shell steel, but only in occasional instances are any details available. With orders placed a few weeks ago, the total of shell steel orders for the use of the United States Government is expected to amount to 1,500,000 tons, and all for delivery by June 15, 1918. As output on a large scale is only commencing, the prospect is that the production will amount to more than 200,000 tons a month eventually; and this is apart from the shell steel requirements of our Allies.

Steel for Shipbuilding

With the arrangements that are being completed for speeding up the merchant

structural shapes could doubtless be duplicated if prosecuting the war required.

With the great difficulty already experienced in maintaining output, the steel mills are hardly likely to get in any position as to enlarge for several months to come at any rate. It is possible that the curtailment in unessential industrial operations may operate to decrease the demand for iron and steel, but in general the appraisal is that with few exceptions the industries to be curtailed are not large iron and steel consumers. Those that are, on the other hand, are likely to be given Government work, and that would help to make up. Some factories, indeed, may consume a larger tonnage of steel when on Government work than when plying their usual vocations. The production of passenger automobiles, for instance, is to be greatly reduced, but the shops will work largely on shells, aeroplane parts, motor trucks, etc.

DEVELOP WATER POWERS TO MAKE NITRATES

CANADA must, to a great extent, look to the electro-chemical and metallurgical industries for the beneficial utilization of its water-power resources. Particularly is this the case with our abundant northern water-powers, where many attractive sites afford natural facilities for low development costs and cheap production of power. While at present these sites are remote from settlement and transportation is sometimes difficult, their utilization appears feasible in some of the processes now being used for making nitric acid and nitrates from atmospheric nitrogen.

In this connection some of the principal features of the various methods at present in use are of interest. Nitric acid from the atmosphere can be produced with the aid of electricity in two different ways. One of these, the indirect method, is the only one so far employed in Canada, where works of considerable size have been in operation for some years. This method combines a number of separate operations, carried out in separate plants or factories. These operations comprise the making of calcium carbide from coke and lime, and a combination of the carbide with nitrogen gas to form calcium cyanamide. The latter may be used directly as a fertilizer, but for explosives or other industries using nitric acid the acid is obtained by a third operation involving a treatment with superheated steam and air.

In the direct method air is blown through a long electric flame, forming nitric oxide gas which, on cooling, takes up more oxygen and becomes nitrogen peroxide. When the latter is brought in

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayaquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Rey, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

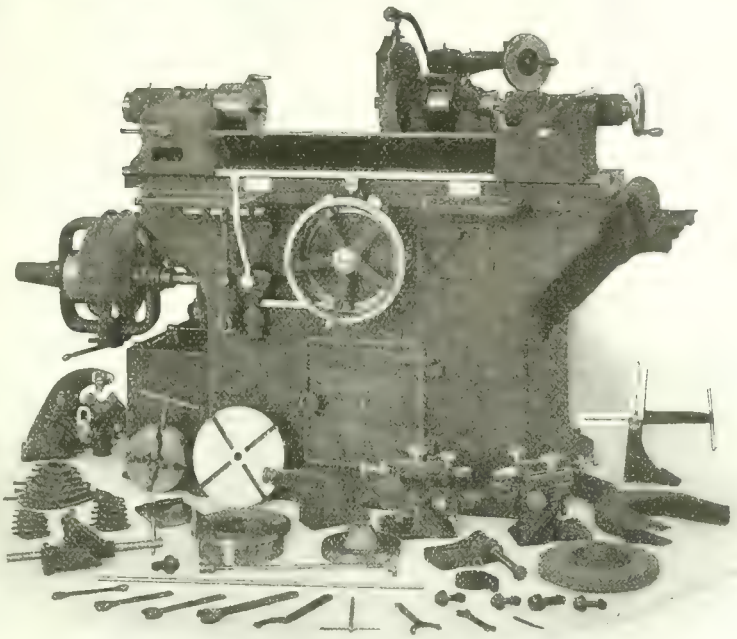
NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

Landis Grinders *for* Production



12" x 36" Plain, Self-contained.

Immediate.

12" x 52" Plain, Self-contained.

2 Weeks' Shipment.

No. 3 Universal 12" x 42".

January Shipment.

Write for Bulletin giving detailed description.

A. R. W LLIAMS MACHINERY CO., LIMITED WEST FRONT STREET TORONTO

Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

FOR SALE

1—60-ton Watson-Stillman Hydraulic Press, complete with four plunger automatic variable belt pump. $750.00.

1—Boring Lathe, 32" swing, length over all 19' 6". approximate weight 9 tons. $2750.00.

1—Turning Lathe, 32" swing, length over all 15' 10", approximate weight 8½ tons. $2750.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ⅛ to ¾". $410.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $690.00.

1—Hall semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $640.00.

1—Hall double-head, semi-automatic Nipple and Pipe Threading Machine with countershaft capacity 1½ to 4". $1000.00.

20—Spicer Steel Trucks, 28 x 90", weight 400 lbs., capacity 2½ tons. Each $25.00.

2—24" Hoefer Stationary Head Drills, steel gears throughout, ball thrust bearings, 3 step cone. $159.00.

Shafting, Belting, Hangers, etc.

GREENFIELD CONDUIT CO., LTD.
331 KING ST., TORONTO, ONT.

contact with water it gives nitric acid. The process is simple, requiring only a suitable factory and cheap power, such as the two millions of horse-power of air and water now running to waste at the Niagara Falls, which could be established at the most reasonable cheap electrical power.

It will be seen, therefore, that the direct method of fixation of atmospheric nitrogen is an important one, while, as just stated, the only raw materials required in the direct method are air, water and cheap electric energy. It would, therefore, appear that much should be expected from this direct method in the utilization of our northern water powers.

Nor need this industry be confined to the development of new water-power sites. Mr. E. K. Scott, who is in charge of the direct type is named, suggests the erection of plants of as low as 1,300 h.p.

BRAZIL MACHINERY MARKETS

The Latin American Trade Supplement of the Department of Trade and Commerce has the following to say in regard to machinery markets in Brazil:

Just as Pernambuco state forms the centre of the sugar industry, so is the state of Minas Geraes the centre of the great mining industry. Here are situated most of the gold-producing mines, although the precious metal is found—and worked in a greater or less degree—in practically all of the states of the Union. The future for mining plant in this state is enormous. It is estimated that there are in sight 500,000,000 tons of high-grade iron ore; it is usually in oxide of iron, and much of it is 50 or 70 per cent. pure iron. Already several English capitalists have determined, as soon as normal conditions are restored, to work these deposits upon a comprehensive scale, and as British machinery is acknowledged to be the best for the purpose, manufacturers should keep the fact in their minds.

There must also be arranged a continuous supply of coal, as the lack of this fuel has hitherto seriously interfered with the success of the Minas Geraes mining industry. In the same state, as well as in those of Matto, Grosso, Bahia, and others, are rich deposits of manganese ore (50 per cent. pure), consisting of oxides and silicate; already one large plant has been erected, that of Morro da Mina, having an average annual output of 60,000 tons. While the States are exporting between 150,000 and 250,000 tons every year, there are many millions of tons as yet untouched. Numerous machinery plants will be required to deal with them.

Evidence accumulates that the gold resources of Northern Ontario are extensive. Developments at Porcupine have been well up, and Kirkland Lake shows signs of being a good camp. A satisfactory feature is that the newer gold camps are scattered over a wide area

Victory Loan Justifies Democracy

An address on Victory Bonds, their character and economic advantage, delivered by H. C. Noxon, the eminent bond expert, before the staff and employees of the United Fuel Companies.

"IN the dark days of war," Mr. Noxon began, "Britain was able to raise all the money required to finance the war, herself, but when she had to advance money to the Allies it was necessary for Canada to do the bulk of her own financing in connection with the war. Something in the nature of a contra account was opened and now, while Britain pays our soldiers and looks after other expenses overseas, she charges them to us. In return we pay for Britain's purchases of wheat and manufactured goods in this country and charge them to her. That is why we must raise money here. If we are called upon for too great an amount Britain will provide the difference.

"We are helping to keep the industrial prosperity going and to help the Allies in the war. As an illustration of how this plan works out, Canada and the United States recently put up $400,000,000 between them to move the wheat crop, knowing that Britain would not want to send this money out.

"The Government and the people are bound together by the principle that underlies other institutions and it is this principle that is at stake. It is a question of whether 'might is right' or 'right is might.'

"This money is borrowed from the people by the people. A Government is only so strong and wealthy as its citizens character and wealth is good. An ordinary bank note you accept willingly and with complete confidence, and yet that note has behind it the same security as this bond. The difference is that the bill is payable on presentation at any time without interest, while the bond is a promise to pay at a specified time with interest.

"Every bond is an agreement, but bonds are different in character. The Government bond or debenture is a straight promise to pay gold for the paper when due. There are coupons attached stating that so much interest is payable at certain dates at the set rate. The bond with the coupons, is payable in most cases 'to bearer' in order to facilitate handling. If they are burned you can get new ones issued providing you have some evidence to show you possessed them. They are so designed that they can be passed through the ordinary channels of business with ease.

"Government security affords the highest possible security for borrowing purposes. The bank lends 90 cents on the dollar on government securities. That is value enough, and furthermore a bond is a recommendation. A man who owns government bonds is well thought of by the bank and it will help him in borrowing money.

"The most profitable bond from the standpoint of profit is the longest term bond. The most interest in the meantime is on the shortest term bond, because the Government gives every person a bonus which is not apparent on the face of it. On the 20 year bond you get 5.60 per cent. and on the five year bond you get 5.80 per cent."

Mr. Noxon pointed out that with money available at 4 per cent. under normal conditions, the owner of a Government bond at 5½ per cent. interest would be getting $5.50 per year on a $100 bond while the other money lender would be getting $4. On this basis, Mr. Noxon pointed out that the bond would sell at a premium of $112 at the end of ten years. With interest added to this it was evident that the bond repaid interest at the rate of 6¾ per cent. as compared with 5.80 per cent. on the five year bond.

"In the meantime" said Mr. Noxon "the money is not absolutely tied up, and the bond will sell better than any other securities. Wealthy corporations of the United States buy bonds from 100 to 200 years recognizing that the investment opportunity is so favorable."

Mr. Noxon stated that in his opinion Canada would recover quickly from the effects of the war and he pointed to the day when Canada would be one of the greatest countries in the world.

"It is desirable that all be done to end the war. We have no desire to prolong it, but to drop it now would be to return to worse conditions in a short time.

"We want to prove to every country of the world that democracy does not breed selfishness, but that it breeds wisdom, fellowship and self-sacrifice. If we cannot prove that we had better take an autocratic government.

"There is no question about what these bonds are worth. The purchaser rises in the opinions of his fellow people. And there is no question about the country needing it. Canada with 7,000,000 people should be able to put up $300,000,000. The greatest number of subscriptions will prove the strength of democracy.

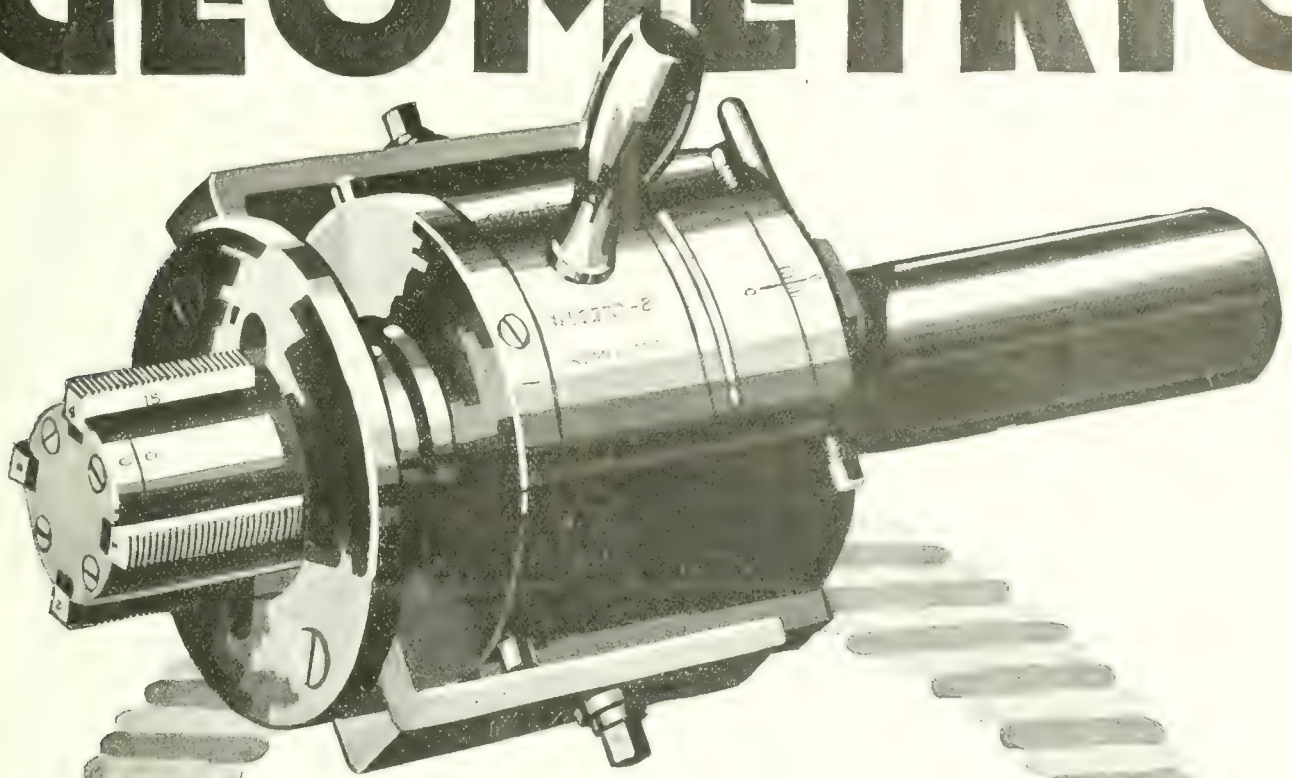
"Sacrifice is the highest form of patriotic privilege. The country is governed by principles so democratic that, being right, you feel you have to see this thing through to the end."

Answering a query as to what style of bond he would advise for a small investment, Mr. Noxon answered that a $50 bond would not have as good a market value for a long term as would the larger bond.

Mr. Noxon pointed out that the banks would not guarantee bonds against fire, but that nevertheless a good practice was to deposit the bond and get a receipt for it. The coupons are then put to the credit of the savings account of the owner as they come due.

"The highest compliment you can pay to the country is to buy a bond," said Mr. Noxon in conclusion.

GEOMETRIC



The Tap Famous For Good Work

Geometric Collapsing Taps share the popularity of Geometric Die Heads. They have the same good reputation for tapping inside threads that the Die Heads have for cutting outside threads. All objections of a solid tap are overcome in the Geometric Collapsing Tap. They are as rigid as solid taps while cutting, but collapse the chasers automatically when the required depth of thread has been cut. Are adaptable to Screw Machine, Turret Lathe or Live Spindle. Made in sizes suited to any diameter above ¾-inch in straight threads or standard pipe thread sizes.

Write for the Geometric Collapsing Tap Booklet.

The Geometric Tool Company

NEW HAVEN, CONN., U.S.A.

Canadian Agents:

Williams & Wilson, Ltd., Montreal

The A.R.Williams Machinery Co., Ltd. Toronto, Winnipeg and St. John, N.B.

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Moncton, N.B. —

Vancouver, B.C. —

Port Arthur, Ont. —

Toronto, Ont. —

Drummondville, Que.—The Aetna Explosives Co. are again operating their plant which has been closed down for some months. The acid departments are being operated at capacity to manufacture sulphuric and nitric acids, and the output is at the rate of 3,000 tons monthly.

Brockville, Ont.—The G.T.R. engine shops narrowly escaped destruction on Sunday night by a fire which broke out in the oil room and spread to the northern annex, wherein were located the machine shop and the blacksmith shop. They were completely gutted and much valuable machinery was ruined. The loss will run into the thousands, and is covered by insurance.

Orillia, Ont.—The new electric power plant at Swift Rapids, on the Severn River, was formally opened last Thursday. The new plant succeeds the one at Ragged Rapids, which has done duty for many years. It is a mile and a half farther down the river, the change being necessitated by the construction of the Trent Valley Canal. The new dam has forty-five feet head of water, and the three electrical generators installed will give a total of 5,400 horsepower.

Hudson Bay Line Finished in Spring. According to J. D. McArthur, head of the McArthur Construction Co., the Hudson Bay railway is now all graded from The Pas to Port Nelson, and steel laid to a point 92 miles south of Nelson, with a prospect of a complete line to the great inland sea early next spring. With respect to the Alberta and Great Waterways line, Mr. McArthur states that the rail head is now at Fort McMurray on the Athabasca river, 290 miles north of Edmonton, and so soon as the war is over [illegible] money gets a little easier, a boat service will be established between McMurray and the Arctic Ocean.

Hamilton, Ont. — The Robert H. Hassler Co., of Indianapolis, Ind., manufacturers of the Hassler shock absorber, have decided to locate their Canadian factory in Hamilton. Fred. Morris of the F. G. Morris, Ltd., Canadian distributors of the Hassler shock absorber, and Mr. Marsh, the Industrial Commissioner for Hamilton, have been instrumental in securing this new industry for the city. J. C. Piper will be managing director of the new company who have leased a building on Sherman Ave. N. for a factory.

MUCH SHELLMAKING ACTIVITY IN SIGHT

We are in a position to state that the Imperial Munitions Board, Ottawa, have received instructions from the British Government to issue contracts for shrapnel, 4.5 in. and 6-in. shell, to Canadian firms equipped for same, the volume of these contracts being such as to run well into the New Year.

INCORPORATIONS

Renfrew Refrigerator Co., has been incorporated at Ottawa by R. Handley, A. Blue and S. Moffatt all of Renfrew, Ont., to manufacture refrigerators and refrigerating appliances of all kinds at Renfrew, Ont., with a capital of $100,000.

Ker-Carb Ltd., has been incorporated at Ottawa by T. H. Spence, L. M. Heal and M. Lee all of Toronto to manufacture all kinds of motors, engines and accessories, etc., at Toronto, Ont., with a capital of $20,000.

Fraser Brace & Clarke Ltd., have been incorporated at Ottawa with a capital of $500,000 to build steamers, ships, dredges and boats of all kinds at Montreal. The incorporators are F. W. Sharp, A. Falconer and J. L. Reay, all of Montreal.

CONTRACTS

Toronto, Ont.—The Gutta Percha & Rubber Co. and the Dunlop Tire & Rubber Co. have been each awarded a tender for 2,500 feet of hose at $1.15 a foot by the Board of Control.

GENERAL

Paris, Ont.—Fire of unknown origin early on Sunday morning destroyed the plant of the Alabastine Company at Paris, with a total loss of $35,000, partially covered by insurance.

Brockville, Ont.—The Laing Produce & Cold Storage Co. has taken over the old Brockville brewery and is installing a plant for making condensed milk. The company has installed a cold storage and refrigerating plant.

TENDERS

Ottawa. — Assistant City Engineer Askwith has been given permission to call for tenders on the supply of an apparatus for thawing out city water pipes. The style of apparatus the engineer desires is gasoline-driven and mounted on sleighs. The estimated cost is $3,500.

Armagh, Que.—Gouvin & Beauchemin, civil engineers, Quebec, are preparing plans and specifications for power development at Armagh, County Bellechasse, on River Fourche-du-Nord-Ouest, and will receive tenders for water turbines, dynamos, sluice-gates, penstock and wooden pipes, etc.

Ottawa, Ont. — Tenders will be received until Tuesday, December 4, 1917, for the installation of freight elevators at the Government Printing Bureau, Ottawa. Plans and forms of contract can be seen and specification and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, the Overseer of Dominion Buildings, Post-office, Montreal; and of the Clerk of Works, Postal Station "F," Yonge Street, Toronto.

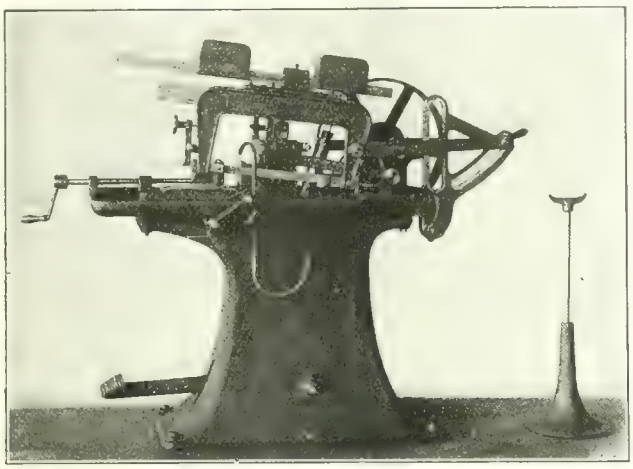
PERSONAL

H. M. Lee has been appointed manager of the Bond Engineering Works, Ltd., Toronto. This new concern is a subsidiary of the Bond Foundry and Machine Co., Manheim, Pa.

G. R. MacLeod, head of the sewer department of the City of Montreal, has been appointed by the Imperial Munitions Board to an important post in their organization now being established at Washington, D.C. Mr. McLeod has been granted leave of absence by the Board of Control for an indefinite period.

J. Frater Taylor, president of the Algoma Steel Corporation, Sault Ste. Marie, Ont., will retire from this position at the end of the present year. Mr. Taylor will still retain his association with the Soo industries in an advisory capacity as chairman of the Lake Superior Corporation. It is understood that W. C. Franz will succeed Mr. Taylor

Starrett METAL CUTTER



Starrett Hack Saws of finely tempered tungsten steel cut quickly—and they last. One is made for every purpose. Valuable information on the best blade for each class of work will be sent if you ask.

Built by world's greatest toolmakers and universally acknowledged the machine of super-efficiency

Aikenhead's

can promptly ship.

Saw cannot drag on return stroke. Its full length is utilized in cutting from 1 to 6 inch stock. Quick-acting tightener ever holds it square.

Saw frame, adjustable to wear, locks at any height. Work is set with greatest convenience.

Machine started with frame up approaches the work, oil dash pot preventing the saw dropping and breaking or stripping teeth.

In finished workmanship equals a machine tool of Starrett make. Fast cutting at operating cost the least; built durably for service extraordinary.

Write Aikenhead's for Catalog.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - Toronto, Canada

New WAHLSTROM Chuck

Drills, Reams, Counterbores and Taps Without Stopping Spindle

Automatic in action; of positive drive; it self-centers the tool. Chucks Morse Taper Shank Drills Nos. 1, 2 and 3, with or *without* a tang.

Get It At

Aikenhead's

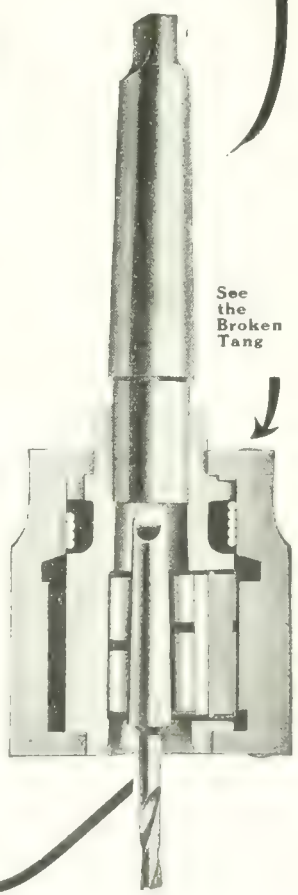
for Taper or Straight Shank Tools

Chuck in one hand, insert or remove drill with other—without stopping spindle. Drill any number of holes varying diameters, no matter how many spindles are in your drill press.

Wide in range—without collets, sockets or keys—the New Wahlstrom is the strongest, quickest Drill Chuck money can buy. It will save you 50% in actual labor, if not more.

Ask for Catalog.

Aikenhead Hardware Limited, 17, 19, 21 Temperance Street TORONTO - CANADA



as president of the Algoma Steel Corporation.

G. D. Perley [illegible] Walter B. Perley, of the Canadian Steel Corp., Ltd., Ojibway, Ont., and [illegible] the firm of W. H. Gale & Co., New York, importers and exporters. Mr. Perley has been connected with the Carnegie Steel Co., Youngstown, O., for several years.

Captain William McNeill, formerly commander of the Anchor-Donaldson [illegible] Line, the [illegible] Quebec, [illegible] recently, Capt. McNeill was commander of the Pendennis Line fleet, having been a master in this company for the last twenty-four years, during which time he was in command of the Warwick, Lakonia, Amarynthia, Athenia and Letitia. He was one of the most popular captains coming to Canada.

MARINE

Kingston, Ont.—The steamer Belleville, trading on the lakes for years, is to be used on the Atlantic Ocean in war work.

Amherstburg, Ont.—Grabb's Reef gas buoy, Lake Erie, has been replaced by a [illegible] and the gas buoy has been removed to the Dominion dock.

WOODWORKING

Cranbrook, B.C.—The factory owned by the Cranbrook Sash & Door Co., was totally destroyed by fire recently with a loss of $40,000. It will be rebuilt and new machinery purchased.

TRADE GOSSIP

The Channel Chemical Co., Toronto has increased its capital stock to $150,000.

Britain Controls Output of Ball Bearings.—The British Minister of Munitions from November 1 forbids manufacture, sale, and delivery of ball bearings or roller bearings or any part thereof except under license.

Firm Changes Name.—The business formerly carried on under the name of Prack & Perrine, engineers and architects, Lumsden Building, Toronto, will hereafter be conducted by Bernard H. Prack, industrial architect and engineer.

U.S. To Control Tin Imports.—The American Iron and Steel Institute has at the request of the United States Government undertaken the control of the importation of tin from foreign countries into the United States.

Canadian Fairbanks-Morse Co., New Agency.—The Metalwood Manufacturing Co., of Detroit, Mich., have appointed the Canadian Fairbanks-Morse Co., sole representatives in the Dominion for the "Metalwood" line of hydraulic presses and equipment.

U.S. Coke Prices Are Fixed.—Basic prices for by-product coke have been fixed by the United States Fuel Administration as follows: Run of ovens, $6; selected foundry, $7, and crushed over [illegible] per ton, $6.50. Prices for beehive coke already have been announced.

Great Britain Orders Ships in Canada.—A report from London, England, states that Great Britain has placed orders in Canada for twenty-two steel vessels of [illegible] to 8,000 tons, the total tonnage now under construction being 150,000. Orders for wooden ships to the value of $10,000,000 are also under consideration.

Tungsten Market Firm.—The market continues in a strong position owing largely to the demand of European buyers in South America. Arrivals in the New York market have been light. High grade Wolframite is held firm at $25, with sellers asking higher prices. Scheelite is quoted at $26 with some sellers holding for a higher price.

The Richard Lloyd and Co., Galton Works, Steelhouse Lane, Birmingham, England, will be pleased to hear from Canadian firms manufacturing machines and small tools who are seeking agents in Great Britain. Richard Lloyd & Co. are large exporters and importers of high class engineers' tools and supplies, being also contractors to H. M. government departments and British railways.

Butterfield and Co., Rock Island, Que., have recently completed the erection of one of the most complete factories for the production of small tools in the Dominion of Canada, and are now in a position to take orders for all styles and kinds of twist drills and milling cutters, in high-speed or carbon steel, and are especially equipped to handle promptly any class of orders for drills, milling hobs, etc., used in the making of shells and other munitions.

Insurance Rate Down.—On account of the reduction in ships torpedoed during the past few weeks, the U. S. War Risk Bureau on November 23 lowered the insurance rate on vessels passing through the submarine zone from 5 to 4 per cent. This is the second reduction in cargo insurance rates made by Secretary McAdoo within the last two months, the rates having been lowered on October 6 from a 6½ per cent. maximum to 5 per cent.

The Turbine Equipment Co., Toronto, have recently received the following contracts: Brunner Mond, Ltd., Amherstburg, Ont., three De Laval pumps, each having a capacity of 3 million gallons per day against a total head of 200 feet. For the town of Pembroke, Ont., one 2-stage De Laval pump, having a capacity of 2-million gallons a day against 320 feet total head. The Dominion Steel Corporation, Sydney, N.S., one De Laval 2-stage motor-driven pump.

Lake Superior Steel Corp. Output.—The statement of the Lake Superior Corporation for the four months ended October 31 shows steel tonnage production 165,477 tons of ingots, against 131,572 for the corresponding period last year. Unfilled orders October 31 were approximately 380,000 tons. Blast furnace production was interrupted through labor troubles at the coke ovens. The steel output generally is gratifying and within recent weeks has shown a considerable and steady improvement.

Electric Steel Furnaces in Great Britain.—In Great Britain 131 electric steel melting furnaces are now operating or under construction or represented by application for permit, according to the London "Ironmonger" of October 20. They are distributed as follows: Heroult, 48; Greaves Etchells, 33; Electro-Metals, 27; Rennerfelt, 7; Snyder, 6; Stassano, 4; Stobie, 3; Induction, 2; Girod, 1. Of the total, 70 are in Sheffield. This probably makes the largest number of such furnaces in any one centre in the world.

Dominion Bridge Gets Big Order From U. S.—The Dominion Bridge Co., Montreal, has received an additional order for 10,000 tons of fabricated steel from the American International Corporation. Some two weeks ago orders from the same source amounting to 40,000 tons were announced, so that the total has now been increased to 50,000. The American International Corporation will require 335,000 tons of steel for the construction of 130 boats, contracts for which have been received from the Emergency Fleet Corporation.

U. S. Zinc Production.—It is understood that the zinc production of the United States has dropped over 30 per cent. from the highest levels attained when all plants, old and new, were running at full. This would indicate a curtailment of approximately 240,000 tons in the annual rate. During the first half of 1917 zinc was turned out at the rate of over 722,000 tons per annum, while in the ensuing quarter it was cut down to a basis of about 626,000 tons a year. The higher figure represented the top notch of spelter production resulting from increasing capacity for existing plants and the construction of many new smelters throughout the West.

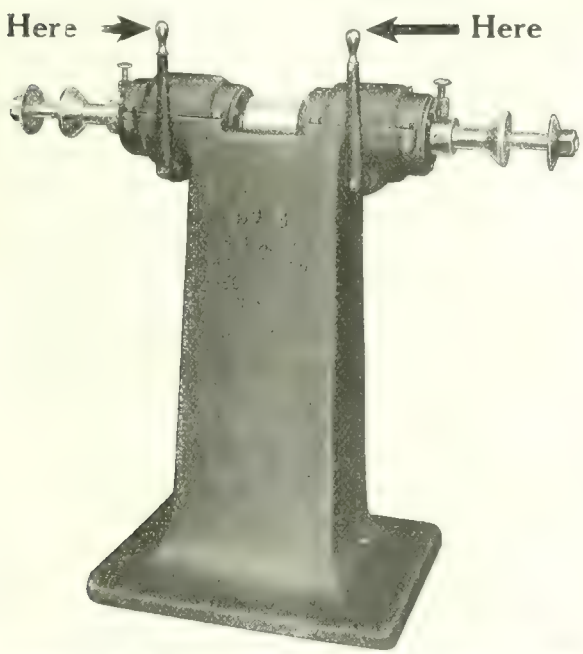
Big Ship Merger on Great Lakes.—Virtually all of the bulk freight ships on the Great Lakes, a fleet of approximately 400 ships carrying ores, coal and grain on the five inland seas, will be "mobilized" next season in the interest of efficiency, operated under one management. The Lake Carriers' Association, on approval so far of members holding 85 per cent. of the tonnage represented in the organization, has voted for the mobilization. The association's members own or control more than 90 per cent. of the bulk tonnage on the lakes. The committee which will have in charge the operation of the large fleet has been unanimously chosen, and this winter will outline in detail its work for the 1918 season.

Coal Gas in Motors.—The British Automobile Association has been in communication with the Ministry of Munitions concerning the use of coal gas on motor vehicles. The association asked for an official assurance that coal gas may be used on motor cars without restriction. The Minister of Munitions has replied that, so long as the gas is conveyed, as at present, in bags at or

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

Efficient Service Won A Place

for the **Johnson Friction Clutch** on The Gardner No. 3 Ball Bearing Polishing Lathe. **The Johnson Friction Clutch** disengages the spindle and acts as a brake at the same time. **Think**—from full speed of 2,500 r.p.m. to locked position, or positive stop, in **five seconds.**

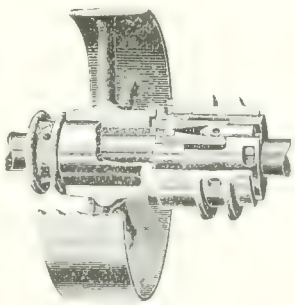


Gardner No. 32 Double Spindle Ball Bearing Polishing Lathe
Courtesy the Gardner Machine Co., Beloit, Wis.

Look! One employee polishing while the other is changing the polishing wheel. JOHNSON FRICTION CLUTCHES make this possible. Have you thought of Friction Clutches for your machine? Investigate the possibilities of JOHNSON FRICTION CLUTCHES on your machines. Write for full information TO-DAY.

Send for our Booklet "Clutches as Applied in Machine Building," and our Yellow Data Sheets.

The double spindle polishing lathe is driven by one belt, still each spindle may be operated independently. HOW? Through the use of JOHNSON FRICTION CLUTCHES. In the polishing lathe shown single JOHNSON FRICTION CLUTCHES are incorporated in the head of the machine, one on each spindle and are operated by the hand levers.



Standard Single Clutch with Pulley

Double Spindle in Actual Operation

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal: Can. Fairbanks-Morse Co., Ltd., Toronto. England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles. Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

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[illegible] above atmospheric pressure, and not considered as steel cylinders, it is not considered that there is any need on general grounds for restricting the use of coal gas for motor purposes. At the same time it is pointed out that it might become necessary at some future time to impose restrictions.

U. S. Emergency Fleet Corp. Place Contract.—The United States Emergency Fleet Corporation, New York, has placed a contract for thirty-six 3,500-ton ocean-going boats with the American Shipbuilding Company, instead of with Robert Dollar. The construction of these boats will require about 1,165 tons of steel, or a total of nearly 42,000 tons of plates and shapes. The boats will be 261 feet long and 43 feet beam. The contract price is reported to be $700,000 for each boat, or a total of $25,200,000. Construction will be on the Great Lakes and deliveries will be made next July or August. At the South Chicago plant the American Company is building additional ways, which will give it a total of six berths in the near future.

Given Stern Sentence.—Five years at hard labor in the army disciplinary barracks at Governor's Island was the sentence of a courtmartial in the case of Charles E. Gerlach, of Brooklyn, second officer of an army transport, because he refused to serve as a lookout for submarines and torpedoes while his ship was in the European danger zone. This became known on November 23 when Judge Hand, of the United States District Court, granted a writ of habeas corpus on Gerlach's representation that his constitutional rights have been violated, in that he was a civilian and, therefore, not amenable to court-martial. His sentence began October 18. In compliance with the writ, Gerlach will be brought into court on December 3 by the officer in charge of the detention barracks.

Iron Ore Shipments on Great Lakes.—For the week ended November 11, the Committee on Lake Coal and Ore Movement reports 1,090,552 tons of iron ore received at lower lake ports, compared with 1,103,239 tons in the corresponding week of 1916. For the period from January 1 to November 11 ore shipments are placed at 32,008,899 tons, compared with 35,496,546 tons in the same period a year ago. The approximate amount of ore on the docks at the end of the week is placed at 8,028,643 tons. On the same date in 1916 the amount of ore on the docks was 8,409,843 tons. During the week there was an average daily car shortage for ore loading of 1,171 cars, compared with an average shortage of 987 cars in the corresponding week of 1916.

Machine Tools for France.—The regulations for the importation into France of certain machine tools and tools of other kinds are set forth in a report from United States Consul General Thackara at Paris. These requirements are to be complied with by the French importer before giving orders for goods from abroad, as in the case of practically all other imports in France at present, but they may be of interest to the American or Canadian exporter as illustrating the necessity of making arrangements for orders in advance. The regulations differ according to whether the goods are for resale or for use in connection with Government contracts. A copy of the report will be loaned upon application to the Bureau of Foreign and Domestic Commerce, Washington, D.C.

Annual Output of the Furnaces in the U.S. The United States is fortunate in having the premier steel industry of the world to rely upon in time of war. The steel furnaces to-day are producing ingots at the rate of 43,500,000 tons annually. But the total production for the year, according to the estimate of the Iron and Steel Institute, will be 42,600,000 tons, which is approximately half of the total production of the world. When the war began, with the United States as a neutral country, the world's production of crude steel was at the rate of 75,000,000 tons annually, and about 55 per cent. of this tonnage was being produced by the nations at war. Before the United States became a belligerent, the production of crude steel had increased to the rate of nearly 85,000,000 tons per year, of which the Central Powers produced about 21,800,000 tons, and the Entente allies about 20,000,000 tons.

Buoys Will Be Discontinued.—The following notice has been issued to mariners regarding the discontinuance of buoys for the season:—

Detroit River—All gas buoys in east and west point channels, excepting East Channel gas buoy No. 2 and West Channel gas buoy No. 1, will be withdrawn about December 5. On or about the same date Livingstone Channel gas buoys 8A, 13A, 12A and 17A will be withdrawn.

Detroit River, Lake St. Clair and St. Clair River—All gas buoys in these waters, with the exception of those noted above, will be withdrawn about Dec. 8-12.

Lake Huron—Lake Huron light vessel will be withdrawn about December 15, but will be kept on station, however, until the latest practicable date.

Toronto-Hamilton Highway Open.—The Toronto-Hamilton Highway was officially declared open for traffic recently, when Sir William Hearst severed a ribbon with a pair of scissors presented to him for the occasion. The ceremony was held on the border line between the City of Hamilton and the adjoining county to the west. After brief speeches had been delivered, the party made a tour of the road, lunching at Hamilton, where they were greeted by Mayor Booker and his council. On behalf of the Toronto-Hamilton Highway Commission, George H. Gooderham, chairman of the commission, informed Hon. Findlay Macdiarmid, Minister of Public Works, that the road was ready for traffic, and Mr. Macdiarmid called upon the Provincial Premier to declare the road open. Mr. Gooderham stated that it is hoped to replace the Mimico,

Etobicoke, Port Credit and Bronte bridges just as early in the spring as weather conditions will permit. The erection of a high level bridge at Oakville and the completion of the Hamilton en trance are awaiting the convenience of the municipalities interested.

New Patents Registered.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout and Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained: Herbert L. Roberts, life belt; Massey-Harris Co., Ltd., spring bearings for centrifugal separators; Louis E. Barton, methods of obtaining titanic oxid; Titanium Alloy Mfg. Co., methods of obtaining titanic oxid; Louis E. Barton, methods of producing basic titanic-sulphate products and pure titanic oxide therefrom; Herbert E. Haultain, processes of concentrating and separating minerals by flotation; E. N. Moyer Co., school desks and seats; Joseph H. Price, sights for rifles, pistols and like; Percy E. Correll, construction of headlamps; Edgar B. Jarvis, fountain brushes for washing dishes and the like; Wm. Wilkie, heated appliances for pressing the collars of articles of wearing apparel; Clarence H. Brockelbank, apparatus or devices to control safe night-landing of aeroplanes; Thomas D. Kelly, cementing materials and the manufacture of substances or compositions therefrom.

CATALOGUES

Machine Tools.—The Terminal Machine Co., Church Street, New York, have distributed to the trade their latest illustrated catalogue of new and used machine tools which they have in stock for immediate delivery. A leaflet bearing the title "The Individual and the War," is enclosed, being a personal appeal for sacrifice and service in support of the State for the successful prosecution of the war.

Machine Tools.—The Davis Machine Tool Co., Rochester, N.Y., have issued a general catalogue describing an extensive line of engine, turret and tool room lathes, cutting-off machines, keyseaters, shapers, drills. The lathes include sizes up to the 42-inch triple geared engine lathe, a complete specification being included for each size together with a table of principal dimensions and an illustration. The other machines are also illustrated and have detailed specifications and table of dimensions. The catalogue contains particulars of a number of attachments, illustrated, and also a babbitt melter.

Hagan Ash Conveyor. The George J. Hagan Co., Pittsburgh, Pa., has issued a new bulletin dealing with the Hagan steam jet ash conveyor. The title of the bulletin is "Twelve Reasons Why Your Choice Should be the 'Hagan,." By way of explaining these reasons, each page of which there are twelve, contains a description of some particular

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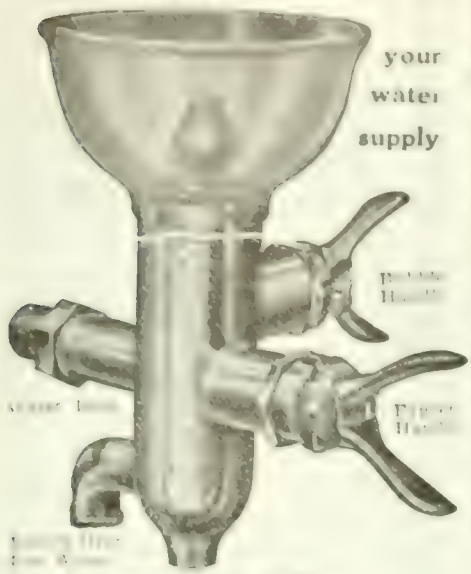

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...capacity of this appliance accompanied by an illustration showing the detail... construction. Particular reference is made to the "Hazan" signal elbow and... system of steam consumption. The illustrations have been reproduced from drawings and show clearly the essential features of the system.

The Whiting Cupola. Catalogue No. 181 issued by the Whiting Foundry Equipment Co., Harvey, Ill., is a new edition of the cupola catalogue presented... illustrations which show the latest developments in design of the Whiting cupola. The catalogue describes the special features of design of this cupola including the patent tuyere system. Other matter deals with economy of fuel, rapid continuous melting, practical hints on operations, etc., and also contains a table of sizes and capacities, and a useful telegraphic code which will be of great convenience to the company's patrons. The catalogue also contains descriptive matter, with illustrations of charging machines, charging cars and cinder mills, etc.

BOOK REVIEWS

Statistical Abstract of the United States, 1915. Published by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D.C. A volume of condensed statistics covering imports, exports, manufactures, commodity and mineral production, railroads, highways, education, agriculture and many other subjects of national importance. The statistics are based upon official figures collated and published under the various laws of the United States or those of other countries to which they may relate. This volume is issued through the Government Printing Office, Washington, D.C.

"Extraction of Gasoline from Natural Gas by Absorption Methods," by George A. Burrell, P. M. Biddison, and G. G. Oberfell, issued by the U. S. Bureau of Mines, Washington, D.C. The extraction of gasoline from natural gas by compression and condensation has been an important and rapidly growing industry in recent years. In 1915 about 65,000,000 gallons were produced by such methods while in 1916 the estimated production was 100,000,000 gallons. This gasoline is of doubled importance in that it can be blended with naphthas. The absorption process is quite different from the older compression process and heretofore has not been described in literature. It is a method only recently commercially applied to natural gas yielding the same quality of gasoline and capable of being applied under conditions where the older process could not be employed profitably. In view of the present needs of gasoline for war and industrial purposes, this additional quantity of gasoline, heretofore a waste and source of expense, is of tremendous importance and may be considered as an excellent illustration of the results the Bureau of Mines is obtaining in its investigations for reducing wastes and increasing efficiency in the petroleum industry. Bulletin 120 treats fully the underlying principles of the absorption process, as well as the methods for testing natural gases for gasoline, the construction and operation of absorption plants, and records the results obtained by several plants of demonstrated commercial success.

INCREASED PRICES MAKE UP DEFICIT

HIGHER prices of metals rather than larger production will probably account for the considerably increased figures of the mining industry this year. The Ontario Bureau of Mines has given out an interesting result of the mining history of the province in the first nine months of the year. This includes the production of the metalliferous mines and works of Ontario and for purposes of comparison figures for the corresponding period of 1916 are also given.

Notwithstanding the falling off in the output of gold, silver and copper, the aggregate value for the nine months was some $2,000,000 more than for the same period in 1916. Higher prices for silver, copper and nickel are largely responsible for this increase.

Of the total gold production, the Hollinger Mine yielded 161,702 ounces, McIntyre 59,779 ounces, Dome 58,978 ounces.

Gold being the standard of value, and having a fixed price, was practically the only metal which did not share in the general increase of prices. Indeed, the high prices of labor and supplies have for the time being lowered the rate of expansion for this branch of the industry. The output for the first nine months of this year was some 20,000 ounces less than for the corresponding period of 1916.

IMPROVED LABOR CONDITIONS RESULT OF WAR

SIR ROBERT HADFIELD has recently stated in *The Observer* that before the war his firm employed 6,000 men and imported many things from Germany. They now employ 15,000 men and make everything previously imported. Working hours have been reduced, with, Sir Robert states, the most satisfactory results. The shorter hours make good men better and bring the medium workman up to something higher than the old-time average. Looking back over recent industrial history, he says that the fact becomes apparent that in the pre-war days we in England were very skilful in our efforts to impede our own progress. On one side the employers, and on the other side the men, devoted vast vital energy to the creation of great combines, each devised as if for the purpose of preventing its side from advancing. Had not Germany forced war upon us we might have had good reason to fear for the future. For years our employers had made an earnest and successful fight against the 48-hour week. Now, under war conditions, when it is necessary that we should produce at a maximum, we have turned to it as a means to just that

end and find it most efficient. The hostility of the men to various progressive things was as unfailing as, for instance, their opposition to labor-saving machinery. Now they have learned that the better the tools the better the workman, and that the better the workman he better his pay. An intelligent workman should have more self-respect than is indicated by willingness to do labor which a machine could do as well. In England workers are only now beginning to realize this. The fact that workmen are not themselves machines is not yet appreciated at its full value even in America, for if workers should be too proud to rank themselves as machinery, employers should be too wise thus to rank them All employers have been doing so.

WHALING OUTPUT VALUABLE

WHALE products in various forms have always commanded big prices. As an exceptional instance, a single lump of ambergris, a sort of wax discharged from the sperm whale, was not long ago picked up in Rose Harbor on the Pacific coast and sold for $85,000. This substance is largely used in France as a basis for perfumes and sells at about $40 an ounce.

The oils obtained are produced in four grades. No. 1 is a clear transparent oil; No. 2 is a somewhat clouded liquid, not so thoroughly refined as the first grade; No. 3 is a shade darker; while No. 4 is a deep, almost black, color, similar to the crude mineral oils ordinarily secured by boring.

The fleshy parts of the whale, after all the oil is extracted, is subjected to a process of cooking in great caldrons. The oil rises to the top, is skimmed off, and the residue then goes through a drying process in big rotary dryers. After passing through a crusher and blowers, it is emptied in a long shed and is there sacked and prepared for shipment.

The bones are treated in a similar way, and after being boiled and crushed it is dried out and makes a splendid fertilizer, selling on the market at $80 or more a ton.

There are three working and one idle station on the West Coast of the island, which during the catching season give employment to about 150 men, excepting the boat crews which aggregate about 200 men, who earn about $2 a day.

Every part of the whale is utilized, and almost each year science discovers some new purpose to which they can be put or some new process for their more practicable development.

TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained by writing.

1458. **Wood-pulp.** — A manufacturing firm in Havana, Cuba, which has for some time been buying about 3,500 tons of wood-pulp yearly from Norway and Sweden now desires to import it from Canada, if the required grades can be obtained here. Samples and particulars of the different grades required may be obtained on application to the Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

1463. **Tools and handles.**—A Durban firm of wholesale merchants request samples when possible, catalogues and price lists, with particulars of packing, from Canadian manufacturers of shovels, spades, pickaxes, axes, farm tools, also pickaxe tools and broom handles.

1465. **Wire.**—A British company hand ling metals wish to act as European selling agents after the war for a Canadian wire-drawing factory able to supply copper, steel and nickel wire and similar products.

MAGNETO-MACHINES FOR POCKET LAMPS

THE war may be responsible for a revival in the popularity of electric pocket lamps fed with magneto currents instead of dry-cell currents. Karl von Dreger, of Budapest, has put several such lamps on the market. In the small-size lamps, weighing 450 grammes (1 lb.), one or several springs are put under tension by the repeated pressure of the thumb on levers; a lamp storing energy for 3 minutes would weigh 850 grammes, and a lamp giving a light for 10 minutes would require to be wound up with the aid of both hands, and would weigh 2,350 grammes (5 lbs.). In these lamps the armature is the revolving part. In the lamps of O. Pletscher, we see from the *Elektrotecnische Zeitschrift* of August 30 last, that the field. built of rings, rotates like a flywheel in ball bearings about the double T-armature; there is no collector, but slip rings and brushes are provided, and the gearing consists of toothed wheels.

These lamps weigh only 250 grammes; a large type, of 750 grammes weight, is designed for cycles. If a hand can be spared for turning a small magneto-machine, and a little more weight is not objected to, there is no difficulty, of course, about portable electric lamps.

The Canada Machinery Corporation will erect a steel and brick extension to their plant on Water Street, South. In view of the present high cost of structural steel and the difficulty of obtaining such material, the company are utilizing the building owned by them in Hamilton, this structure being dismantled and re-erected in Galt. The extension will give the company about 24,000 square feet additional floor space and will give employment to one hundred additional workmen.

GERMANY has refused to supply Dutch shipyards with steel save on conditions which will place all new construction in Dutch shipyards at the disposal of Germany and prevent any part of it from passing into the possession of the Allies.

Inferior tools and good mechanics don't co-operate—

In other words, you cannot get an A-1 production from a good man if you don't supply him with the best tools.

You will be sure of getting top notch file efficiency if you supply your mechanics with

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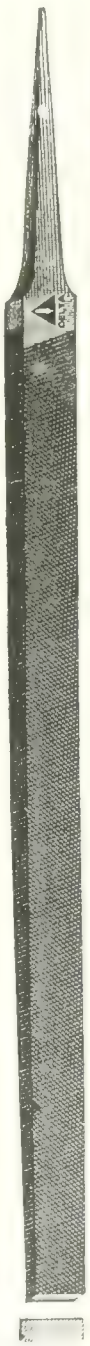

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The "Delta" is the only line of files from 3 to 24 inches made absolutely of crucible steel, and their manufacture is guided by half a century's file making experience.

There is a shape and size to suit every requirement.

Our trade-mark (satisfaction - or - money - back - guarantee) is on every tang.

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PUNCHING MACHINE — POWERFUL BELT- [illegible] punching machine; [illegible] in. x 2½ [illegible] between horns, [illegible] two feet under arm 24 [illegible] screw-driven plate carriage [illegible] plates 6 inches, and one 20 [illegible] plate carriage which is operated [illegible] power drive which [illegible] has large equipment, including punches and bolsters, for [illegible] and one pair of fixed [illegible] at 1½ pitch made by [illegible] Darnell & Wilson, Ltd., Glasgow. William C. Wilson & Co., 21 Camden Street, Toronto. c23m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH [illegible] in Manchester, England, is prepared to [illegible] for a good firm, desiring representative in England. Will attend to the interests of a firm [illegible] Box 347, Canadian Machinery. c19m

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO [illegible] specialty, one who hasn't too many irons in the fire. Apply Box 348, Canadian Machinery, stating lines you now represent [illegible] you are prepared to cover. c23m

WANTED—BY STEEL WORKS IN PENNSYLvania, United States, producing exclusively crucible cast steel, principally high speed steel, a representative in Canada who is thoroughly familiar with the tool steel business and will devote his entire attention to same. Reply Box 354, Canadian Machinery. c24m

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A responsible American Concern desires [illegible] a reliable Canadian Machinery Manufacturer for the production [illegible] of a small Marine Motor, for the Canadian and Export Trade. A modern [illegible] knowledge of economical production of interchangeable machine [illegible] and cost shipping [illegible] favorable, if not continuous, contract is [illegible] Canadian [illegible] c22m)

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MANUFACTURERS WE CAN UNDERTAKE work to any specification munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, [illegible] British shells. Box 340, Canadian Machinery. c19m

WANTED MACHINE SHOP FOREMAN FOR [illegible] shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

MARINE ENGINE ERECTOR:—WANTED FOR Canadian shop an experienced foreman to take charge of erecting 1500 H.P. marine engines. Apply Box 347, Canadian Machinery. c21m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED TO PURCHASE TWO SECOND-hand lathes, 24" swing, 8' to 12' bed. Submit offers with cuts and full description to E. Langham, General Purchasing Agent, Canadian Northern Railway Company, Toronto. c19m

WANTED—VERTICAL MILLING MACHINE with table not less than 26" x 10", minimum distance centre of spindle to face of column 14". Reply, giving full particulars, price and where machine can be inspected. Box 352 Canadian Machinery. c21m

Flat Braiders For Sale

Twenty-five---53 Spindles, No. 1 Make

New England Butt Co. and R.I. Braiders in perfect working condition. Write for particulars. Greenwood Braiding Co., Greenwood, R.I. (c23m)

SECOND-HAND RADIAL DRILL WANTED [illegible] in good condition, 4 ft. to 6 ft. swing. Give full particulars. The Volta Manufacturing Co., Welland, Ont. c21m

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MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GRADUATE MALE NURSE, AGE 32, HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

GENERAL SUPERINTENDENT DESIRES position years of machine shop and toolroom experience, efficient production methods, as well as extensive experience with various sizes of shells. Box 350, Canadian Machinery. c22m

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in Scotland and Canada, a specialist in marine engines and winches, open for engagement; best of references. Apply Box 351, Canadian Machinery. c23m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

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2—16" x 5' Reed Lathes, elevating rest.
1—16" x 6' Reed Engine Lathe, plain rest.
1—16" x 6' Reed Engine Lathe, R. and F.
1—18" x 8' Davis Engine Lathe, D.B.G.
1—18" x 8' Porter Engine Lathe.
1—22" x 10' Nicholson & Waterman Engine Lathe.
1—No. 3 Brown & Sharpe Automatic Gear Cutter.
1—30" old-style Brainerd Automatic Gear Cutter.
1—5" x 18' Pratt & Whitney Plain Grinder.
1—No. 3 Lees-Bradner Thread Miller.
1—15" Jungst Shaper.
2—24" x 24" x 6' Powell Standard Planers.
2—30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

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A complete 4.5" shell plant

1 No. 6 HALL Cut-off Machine.
1 4.5" HAMILTON Heavy Cut-off Machine.
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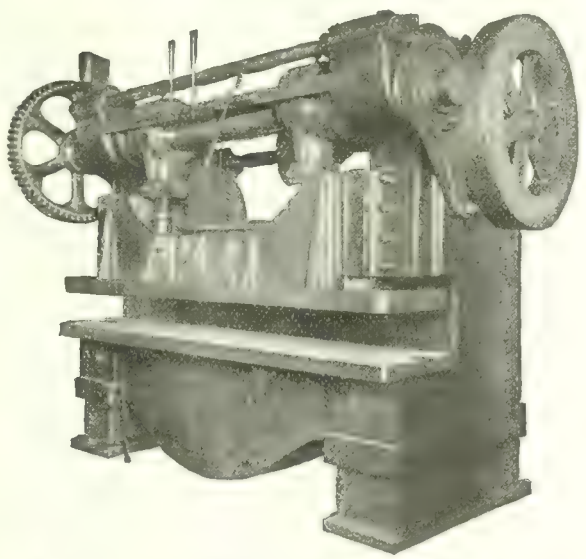
4 HAMILTON Single Purpose Heavy Duty Rough Turning Lathe.
5 HAMILTON Single Purpose Heavy Duty Boring Lathe, with collets.
4 DAVIS 24" Chucking Lathes for boring and tapping nose.
1 18" x 8' REED Lathe for [illegible]
1 18" x 8' BERTRAM Lathe for [illegible]
1 HAMILTON Single Purpose Heavy Duty Lathe for facing base.
1 22" x 8' REED Lathe for [illegible] and taper cutting.
1 20" x 8' BERTRAM Lathe with Bertram waving and undercutting attachment.
1 22" x 8' HEATHER Lathe with [illegible] boring and tapping base.
1 18" x 8' LEBLOND Heavy Duty Lathe for [illegible] boring and tapping base.
1 HAMILTON Single Purpose Lathe [illegible] for turning upper bands.
1 HAMILTON Single Purpose Lathe [illegible] base plate.
1 26" x 12' REED Lathe [illegible] and taper [illegible] base.
1 [illegible] x 6' SEBASTIAN Lathe.
1 18" x 8' MacGREGOR GOURLAY Lathe [illegible] rectifying.
HAMILTON Single Purpose Centering Lathe.
HAMILTON Single Purpose Reducing Lathe.
1 HAMILTON Special Nose Milling Machine.
1 HAMILTON Special Pneumatic Base Plate Riveting Machine.
1 HAMILTON Single Ring Machine.
1 Electric Lever Punching Machine, 60 volts, 60 cycle.
1 HAMILTON Oil-burning Nosing Furnace.
1 HAMILTON [illegible] Hydraulic Press.
Peerless Pumps 1" x 1"
1 Accumulator.
1 No. [illegible] CINCINNATI Universal Milling Machine.
1 24" x 6' PRATT & WHITNEY Engine Lathe.
GISHOLT Tool Grinder.
STEWART Tool-room Geo-faced Bench Lathe.

All tooled up for British 4.5" High Explosive Shells. This equipment is all in good operating condition and can be inspected by appointment.

FULL DETAILS ON REQUEST.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

FOR SALE



Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¼" die space.

Very good condition and for immediate delivery.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave. - - DETROIT, MICH.

PETRIE'S LIST
of
New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16" x 5½" Pratt & Whitney, D.B.G. (3).
16" x 6' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
22" x 8' Pratt & Whitney, B.G.
28" x 8' Martin, single purpose (2).
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
15¼" x 8' Carroll-Jamieson, D.B.G.
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (4).
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (5).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Barnes, 3-spindle, lever feed (2).
24" Foote-Burt, heavy duty.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
16" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer (2).
24" Barnes, wet tool.
2¼" Yankee, twist drill (3).

IRON PLANERS

20" x 20" x 5' Bertram (2).
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads.
40" x 40" x 12' New Haven, power feed.
72" x 72" x 11' Canada, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
No. 2 Cincinnati, universal, cone type.
Monarch, vertical (2).
No. 2 Ford-Smith, plain.
No. 1 Fox, universal.

SHAPERS

16" Petrie, back geared (2).
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared (4).
21" Gould & Eberhardt, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
No. 4A High Speed Riveting Hammer.
⅜" Garvin Vertical Tapping Machine.
No. 3½ Greenerd Arbor Press.
No. 180 Brown-Boggs Power Presses (2).
No. 18 Can. Hanson & Van Winkle Power Press.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

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Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

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DETROIT, MICH.

Good Used Equipment

Traveling Cranes.

20-ton Browning Trolley, 5-ton aux., 56½' ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
20-ton Box, 49' span, 220 V.D.C.
10-ton P. & H., 48' span, 110 V.D.C.

Punches and Shears.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15 tht., cap. ¾ x ½" (hand) new Doty.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7' blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

Miscellaneous.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pine Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION.
PROMPT SHIPMENT.

McCoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—LeoSwing Lathe for turning profiles.
1—Tool Grinder, 34" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—57" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—6 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

Chas. A. Strelinger Co.,

43-51 E. Larned St.
DETROIT - MICHIGAN

Machine Tools For Immediate Delivery

DRILLING MACHINES
No. 1-B 8" overhang Henry & Wright Sens. Drill.
No. 2-K 8" overhang Henry & Wright Sens. Drill.
No. 2-B 8" overhang Henry & Wright Sens. Drill.
4" Radial Sensitive Drill.
No. 21" Radial Upright Drill.
No. 3-5" Radial Drill with Power Feed.
No. 1-S Garvin B.G. Horizontal Drill with tapping attachment.

GRINDING MACHINES
No. 2 Blount Double End Emery Grinder.
4" Diamond Grinder with countershaft and motor.
No. 0 Wells Bros. & Perks "T" Grinder with countershaft.
4" Baker Wet Tool Grinder.
No. 0 Gardner Pl. Bearing Disc Grinder with countershaft.
No. 1 Wilmarth & Morman Surface Grinder.
No. 2 Diamond Aut. Surface Grinder 36x12x12.
Geometric Chaser Grinder with countershaft.
No. 7 Gardner B. B. Polishing Lathe.

LATHES
21" x 5' Type "H" Dalton Lathe with taper and draw-in attachment.
No. 7 Sebastian & Clegg Precision Bench Lathe.
21 x 8 Monarch Q.C., D.B.G. Engine Lathe with taper attachment and oil pan.
16 x 8 Monarch Q.C., D.B.G. Engine Lathe.
16 x 7 Monarch Q.C., D.B.G. Engine Lathe with oil pump.
7 x 8 Sebastian Q.C., D.B.G. Engine Lathe.

MISCELLANEOUS
21" Gisholt Turret Lathe.
No. 1 Wetmore Hand Miller.
No. 1 Standard Hand Miller with oil pump.
No. 8 B Cincinnati Small Milling Machine.
Fischer Oil Groover.
No. 2 Natco Duplex Power Press.
Multicam Type "A" No. 101 Screw Press.
No. 8 Lo-Swing Duplex Cold Metal Saw.
Peerless H.S. Metal Hack Saw capacity 6".
No. 5 Federal Pl. Hd. Turret Lathe.
No. 2A Quickwork Rotary Shear.
No. 1 Garvin Screw Slotter.
4" Geometric Threading Machine.
Type "A" Sloan Valve Seating Machine.

USED MACHINERY IMMEDIATE DELIVERY

DRILLING MACHINES.

30" Lodge & Davis, S.H., B.G., P.F.
31½" Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3 26" B. & S., spur gears
No. 13 B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Schuchardt & Schutte Gear Hobber.

GRINDERS.

No. 1 Cincinnati Universal Tool and Cutter.
No. 1½ Cincinnati Cutter and Tool.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 6-A Diamond Universal.
10" x 36" Landis Plain (new).

LATHES.

10" x 5' LeBlond, C.R., with chuck.
14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
24—27½" x 14' Lodge & Shipley, selective geared head, Q.C.G., 18" chuck, fitted.
24—27" x 12' Reed-Prentice, geared head, single pulley drive.
32" x 12' Schumacher & Boye, 28" chuck, fitted.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 8' Pease, one head.
36" x 36" x 12' Rockford, 4 heads.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Pratt & Whitney, B.G., double friction head, A. C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.
1 ¾" Gridley, 4-spindle automatic.
3 ¼" Gridley, 1-spindle automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24" J. & L., cone head.
24" Gisholt, 1¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 2 Rockford, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 4 Rockford, O.B.I.
No. 7½ Bliss, str. side, geared.
Blake & Johnson Embossing.

MISCELLANEOUS.

4" Nutter & Barnes Cutting-off Machine.
6" x 48" P. & W. Thread Miller.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

AUCTION! AUCTION!

WE WILL SELL AT UNRESTRICTED AUCTION, COMMENCING ON

TUESDAY, DECEMBER 4th, 1917, AT 10.30 A.M.

AND CONTINUING UNTIL ENTIRE STOCK IS DISPOSED OF THE

REAL ESTATE, MACHINERY, EQUIPMENT, MERCHANDISE, TRUCKS AND FINISHED CARS

FORMERLY BELONGING TO THE

PULLMAN MOTOR CAR COMPANY, YORK, PA.

INVENTORY VALUE OVER $1,000,000.

Consisting of over 200 of the finest Machine Tools in the finest of shape, and consists of Cincinnati, Becker Brainard, Fox and Chicago Milling Machines, Steinle, Grenlee, Jones & Lamson Turret Lathes, Whitcomb, Blaisdell, Hendey, Reed, Pratt & Whitney, Springfield Lathes, Bardon & Oliver, Gridley Automatic Screw Machines, Cincinnati, Norton, Landis & Heald Grinders, Schuchardt & Schuette and Fellows Gear shapers and Hobbers, Pratt & Whitney Thread Millers, Avey, Henry & Wright, Barnes, Hamilton, Snyder, Quint Foote Burt Drills and Radials, La Pointe Broach, Toledo & Bliss Punch and Arch Presses, Greenard Arbor Presses, Ingersoll Air Compressors, Pettingill, Yoder, Bertsche Body Machines, etc.

Complete Body Plant, together with all the latest Machinery for Painting and Drying and Upholstering Department.

150 Allis Chalmers, Wagner, General Electric and Westinghouse Motors, ranging from ½ to 120 H. P., all 220-Volt, 3-Phase, 60-Cycle A. C., with Oil Starters.

$75,000 worth of the finest small shop Tools.

$300,000 Standard Automobile Material, such as Pumps, Batteries, Transmissions, Speedometers, Electric Gear Shafts, Spark Plugs, Nuts, Magnetos, Cable, Wire, Grease and Oil Cups, Screws, Shackle Bolts, Bodies, Axles, Springs, Starting Systems, Steering Gears, Radiators, and hundreds of other items too numerous to mention.

$75,000 Upholstering and Painting Material in Fabrikoid, Duck, Linoleum, Hair, Belting, Sorings, Top Sockets, Clincher Buttons, Acme Fasteners, Straps, Leather, Varnish, Enamels, Paints, etc.

500 Ton Body, Sheet and Tin Plates, Ribbon Steel, Tool Steel, Cold Rolled, Hexagon and Flat.

200,000 feet Fine Selected Lumber in all Hardwood.

The entire stock will positively be sold at Public Auction in piece-meal lots only, and will not be put up as entirety at any time.

Parts will be sold December 4th.

Merchandise will be sold December 6th.

SAMUEL L. WINTERNITZ & COMPANY, Auctioneers

506 RECTOR BLDG., CHICAGO, ILL.

100 NEW LATHES Here at McCabe's for Immediate Shipment

These "High Duty" New Lathes will be installed in your shop with understanding there is nothing better built in workmanship — power and convenience in handling.

All-Steel Quick-Change Gear-box

3-step Cone—Double Back-Gears

26-in	Swing—	18-ft Bed
26 "	"	16 " "
26 "	"	14 " "
26 "	"	14 " "
24 "	"	18 " "
24 "	"	16 " "
24 "	"	14 " "
24 "	"	12 " "
21 "	"	12 " "
21 "	"	10 " "
18 "	"	12 " "
18 "	"	10 " "
18 "	"	8 " "
16 "	"	10 " "
16 "	"	8 " "
16 "	"	6 " "

(Get Bulletins with complete specifications.)

"McCabe" Double Spindle Lathes

26-48-in SWING; 12-ft., 22-ft. and 24-ft. Beds in stock.

So many other Tools in Stock — you will have to get our latest Bulletin 283 — just issued — to get complete list of everything.

J. J. McCabe

149 BROADWAY - NEW YORK

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
14 x 15 Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

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1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & CO, LIMITED

HESPELER, ONT.

Machine Tools—We Give You Quality and Service

BORING MACHINES Vertical
2—52" Bullards, 1 turret head.
1 NEW 56" Gisholt, one swivel turret head, motor driven.
2—36" Ransom, 2 heads.
1 42" Ransom, 2 swivel heads, quick change.
1 42" Bullard, two swivel heads.
2—40" Niles, 2 swivel heads.

BORING MACHINES Horizontal.
1 2½" bar, Niles.
1 No. 1 Cleveland, 2½" bar, quick change, almost new.
1 No. 2 Barnett, 3" bar.
1—London, 6" bar.
1 Beaman & Smith, 7" spindle.
1—Barnett, 8" bar.

BULLDOZERS.
1—No. 9 Williams & White, belt drive.
1 No. 12 Avey, single pulley drive.
1 No. 25 Williams & White, belt drive.
1 No. 25 Williams & White, belt drive.
1—No. 29-U Wilhams & White, arranged for motor drive.

CRANES Traveling.
1 Seven Gresholm & Moore, 13½' span, hand power.
2 Seven Electric, 47' span 25' lift, motors.
1 Seven Niles, 52' span.
1—10-ton Whiting, 3 motors, 24' span.
1—50-ton Niles, 61' span.

CRANES Locomotive.
1 15 ton, McMyler Burt gauge Steam Locomotive, 60' scrap bucket, 3 drums.
1 15 ton Industrial Locomotive, swivel 40' boom, bucket.
1 15 ton, Brown Hoist Locomotive, 50' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner, steam locomotive, swivel double drum, 70' boom, bucket.

CUTTING OFF MACHINES.
1—NEW 4½" Davis.
1 Davis 6½"
10—4½" Williams.
1 NEW 6" Davis.

DRILLING MACHINES Radial
1 NEW Model 3 plain, 5' arm, 16" column, belt driven.
1 NEW 3 American, Sensitive, plain attachment.
1 4' Model plain, speed box drive.
1 4' Low Universal, motor drive.
1 NEW 5' Wood Plain, with motor.
1 NEW 5' Model 3 speed box drive, Dec. delivery.
1 NEW 5' Bickford, Jamesway drive.
1 New Bickford, Jamesway driven.
1 NEW 5' Traveler, motor drive, Dec. delivery.

DRILLING MACHINES Heavy Duty
1 Do Quick Change Heavy Duty, 2" capacity, motor drive.
1 Radial Heavy Duty, 2" capacity, No. 2 Base, Single pulley drive, belt type, arranged for motor drive.
1 Model 3 Heavy Duty 2" capacity.

DRILLING MACHINES Sensitive Head
1 NEW ½" Barnes Drill, Barnes Head.
1 NEW ½" Barnes Drill.
5—NEW 28" Sibley.

DRILLING MACHINES Multiple Spindle
1 Eight 2" Barnes, motor driven.
1 No. 1 Sensitive Drill.
1 Two Spindle Upright.
1 Two Spindle Upright.
1 Two Spindle Upright

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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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71 Browns Ave. TORONTO

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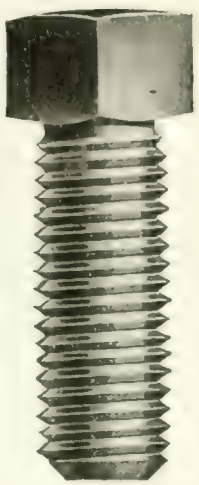

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Prompt service and "GALT" quality goods only.

Specialists in Gap and Set Screws.

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GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

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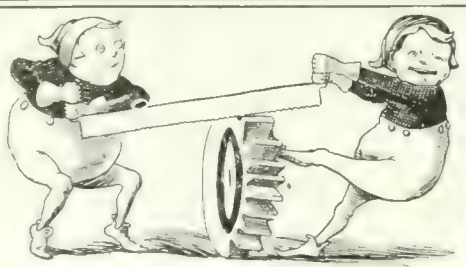
Rawhide, Steel, Iron, Brass.



We Make Grinder Heads, Power Hack Saws, Friction Pulleys, Index Heads.

We cut racks any width, any pitch, to 8 feet in length.

DESIGN AND BUILD SPECIAL MACHINERY

WINNIPEG GEAR & ENGINEERING Co.

197-199 PRINCESS ST., WINNIPEG

BRIDGEFORD
HEAVY DUTY LATHES

Engine Lathes from 26" to 60" swing, Plain Turning Lathes, 24" and 30" swing, Axle and Journal Turning Lathes and Bevel Gear Turning Lathes. Write for Catalogue.

BRIDGEFORD MACHINE TOOL WORKS
161 Winton Road Rochester, N.Y.

Say you saw it in Canadian Machinery

SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies,
Small Tools, Screw Machine Products, Gauges, Etc.

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Shell Manufacturers

Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

NOW IS THE TIME.

The
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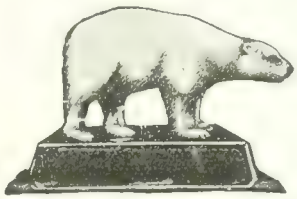

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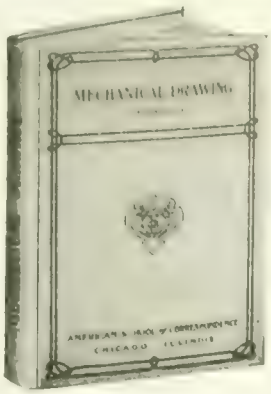

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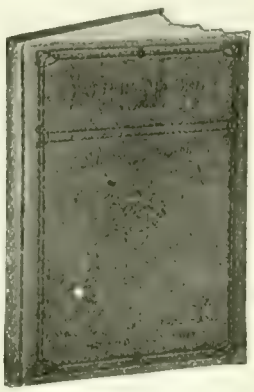

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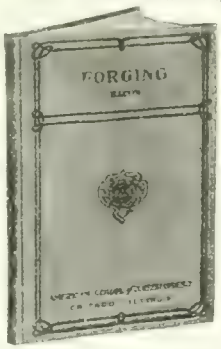

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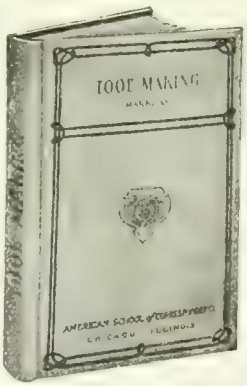

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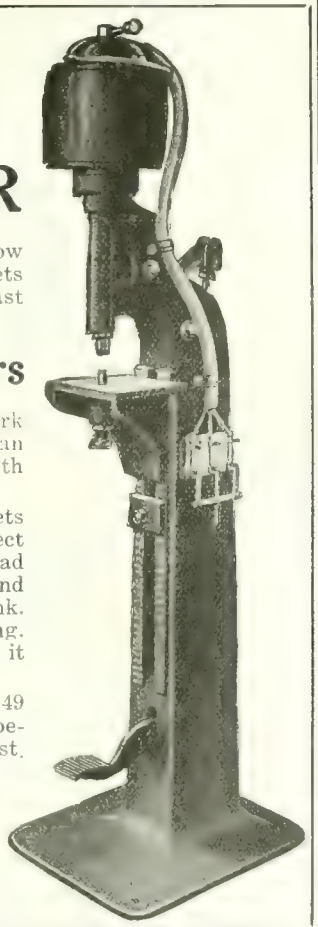

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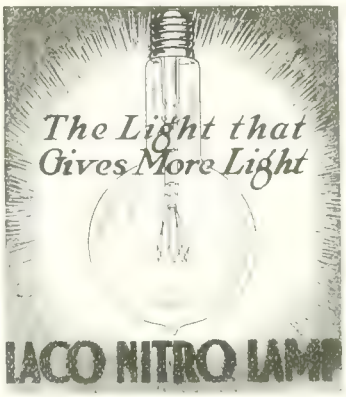

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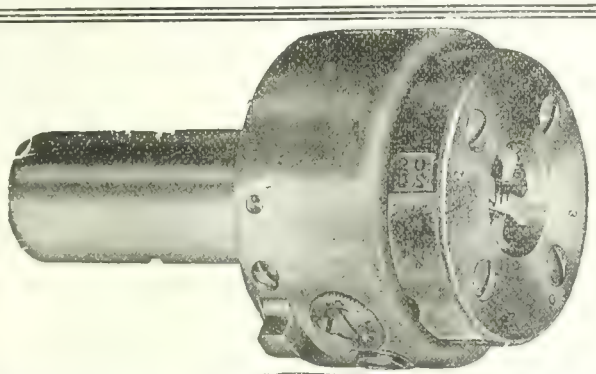

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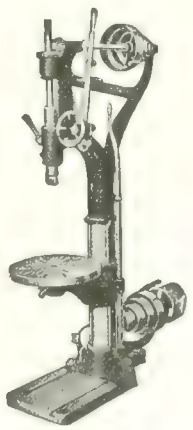

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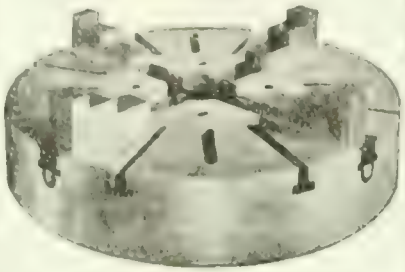

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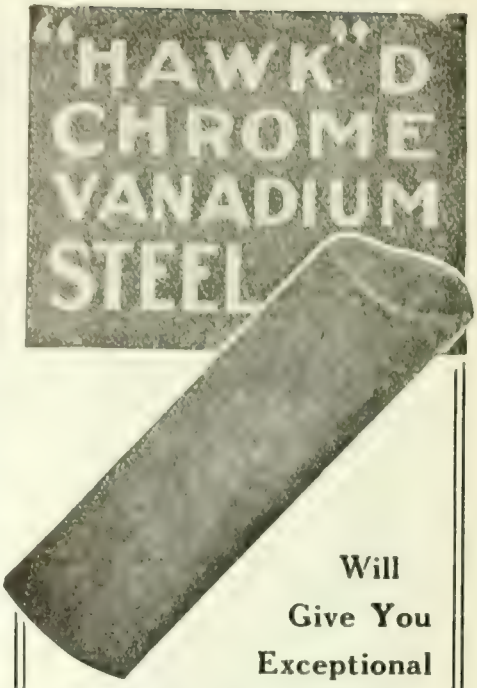

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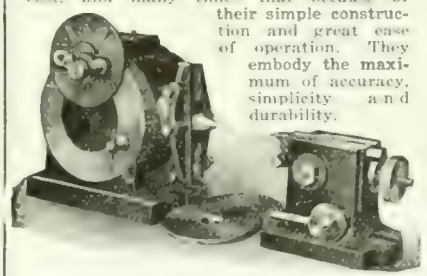

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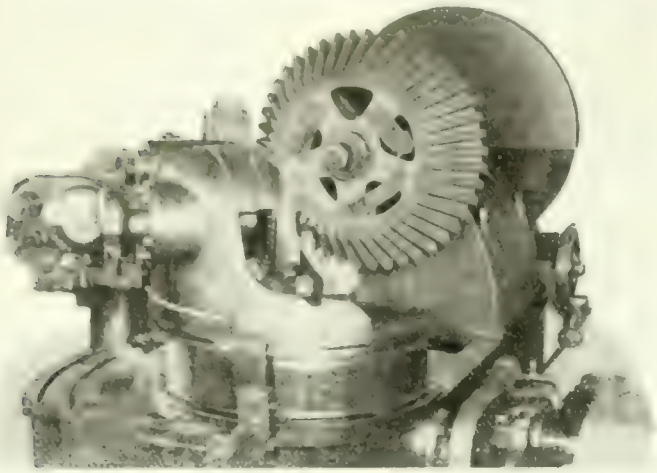

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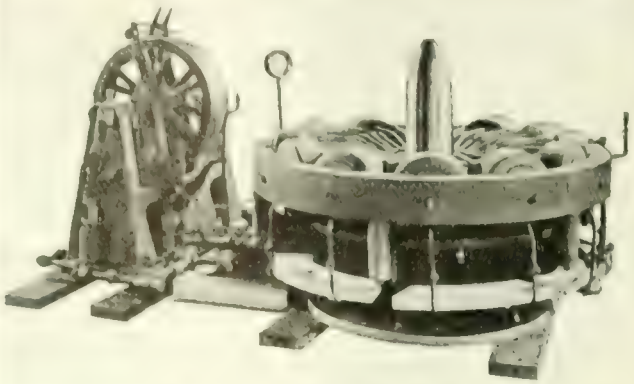

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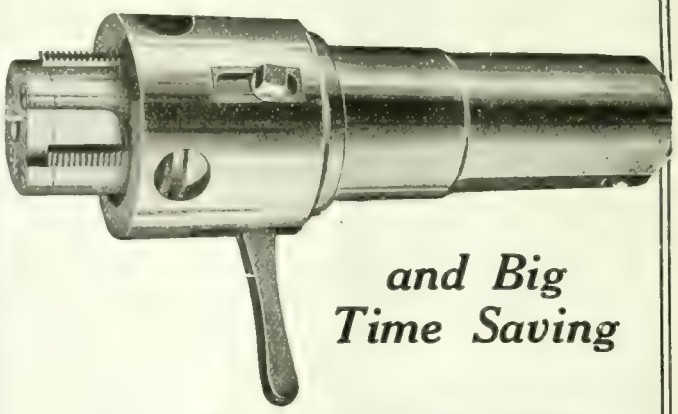

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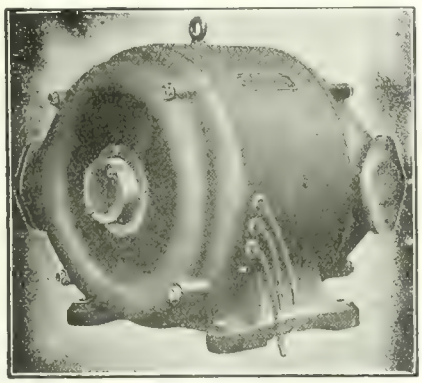

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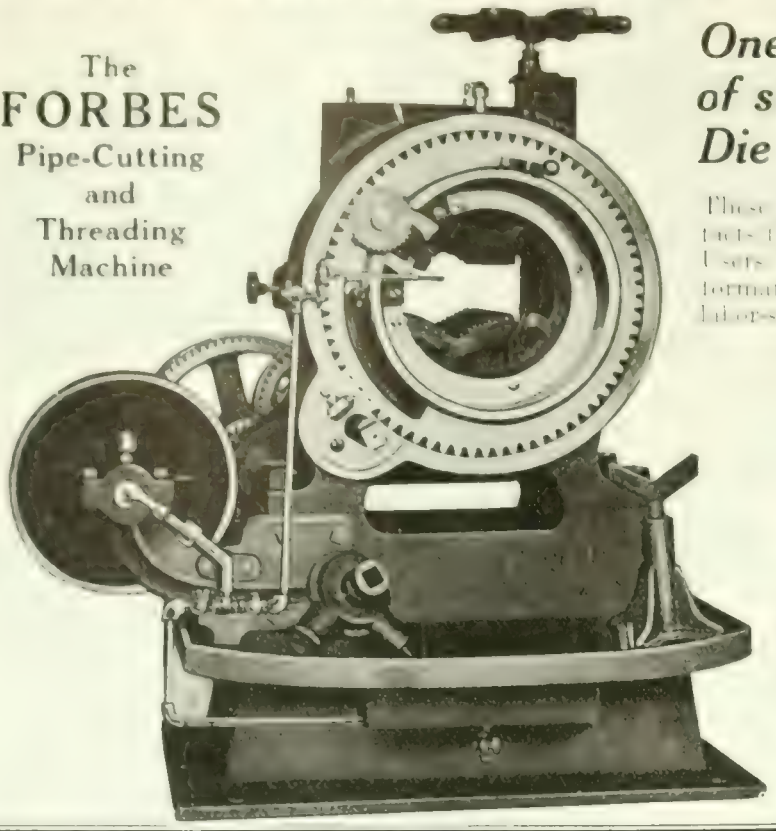

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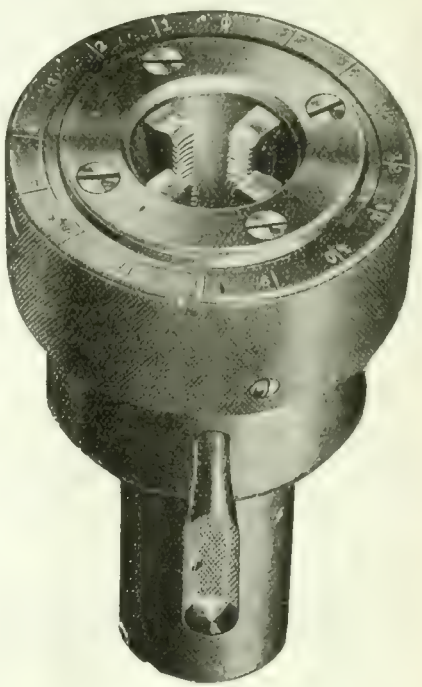

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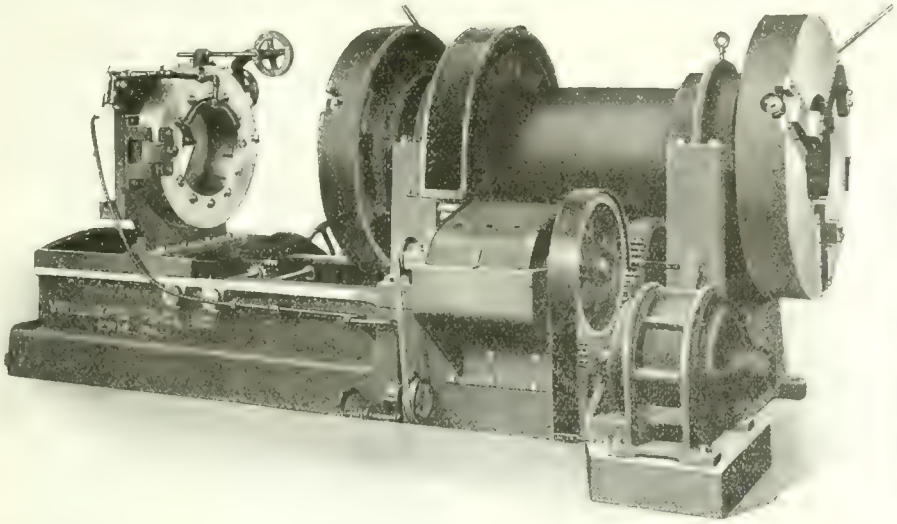

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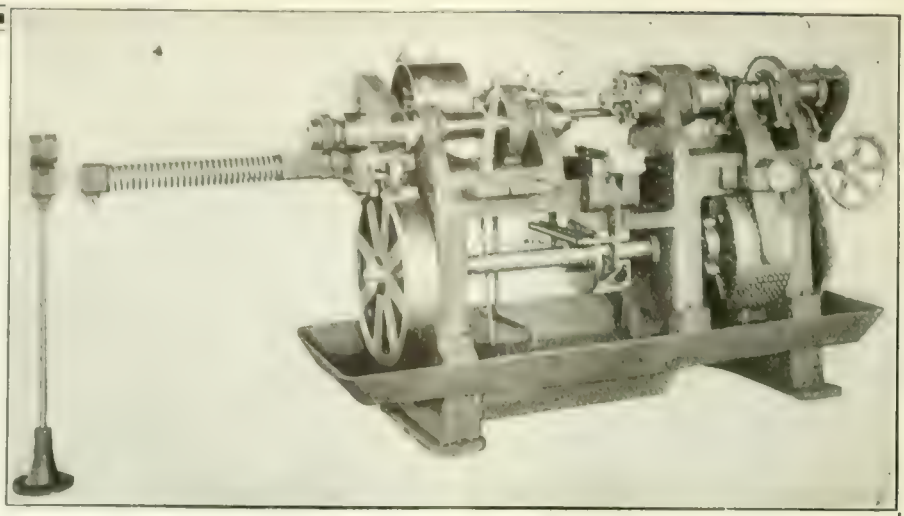

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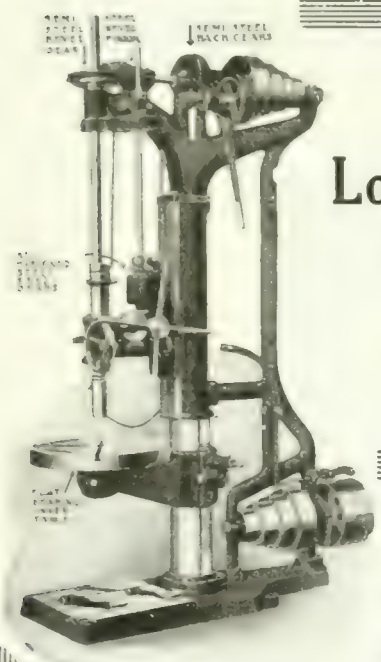

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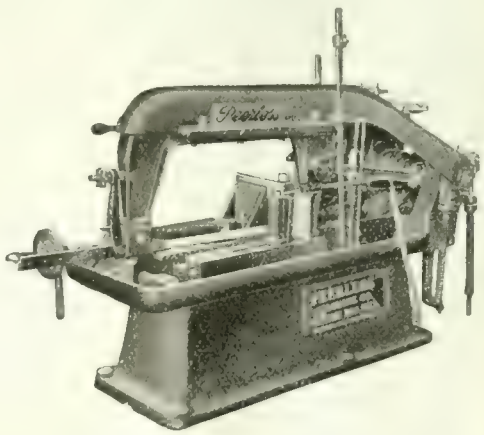
DON'T be governed by World-Wide Reputations and Previous Records in selecting your next Cutting-Off Equipment. The NEW IMPROVED PEERLESS High Speed Heavy Duty Metal Cutting Saw has completely revolutionized and upset all metal cutting standards.

This statement is based entirely upon the reports and repeated orders received from concerns that had heretofore used tools such as referred to.

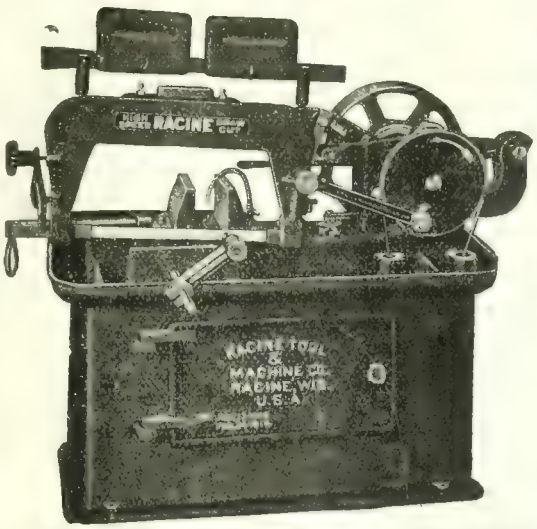


To induce investigation we will gladly ship one for a comparative test. If you do not consider it the best and most profitable tool you have ever purchased, you are under no obligations to keep it, and we will stand the freight charges both ways.

Would you like to see a list of large manufacturers that are continually repeating their orders? We have it ready for you.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

NO DRAGGING BACK ON THE NON-CUTTING STROKE



To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

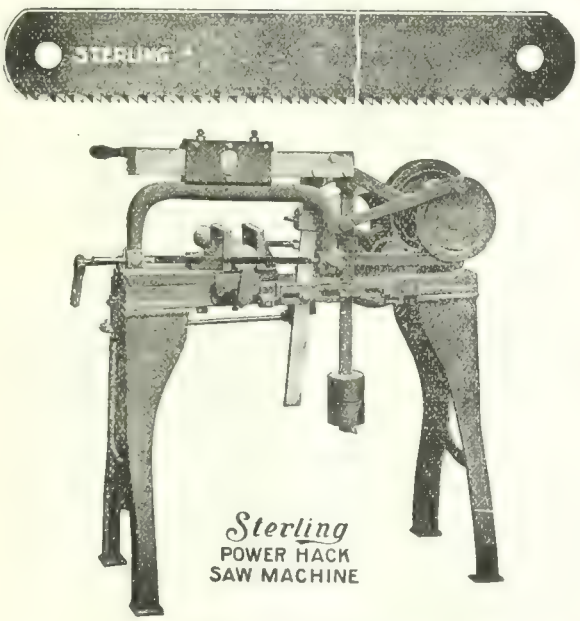
Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168—or if you'd let us ship a Racine on trial terms that you consider fair.

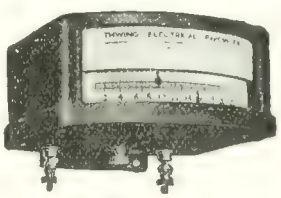
Write us to-day.

RACINE TOOL & Machine Co., 15 Melbourne Ave., Racine, Wis., U.S.A.

"STERLING" HACK SAWS



MANUFACTURED BY
DIAMOND SAW & STAMPING WORKS
BUFFALO, N.Y., U.S.A.



Insuring Accurate Temperature Measurements

THWING
HIGH RESISTANCE MULTIPLE RECORD PYROMETERS

are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

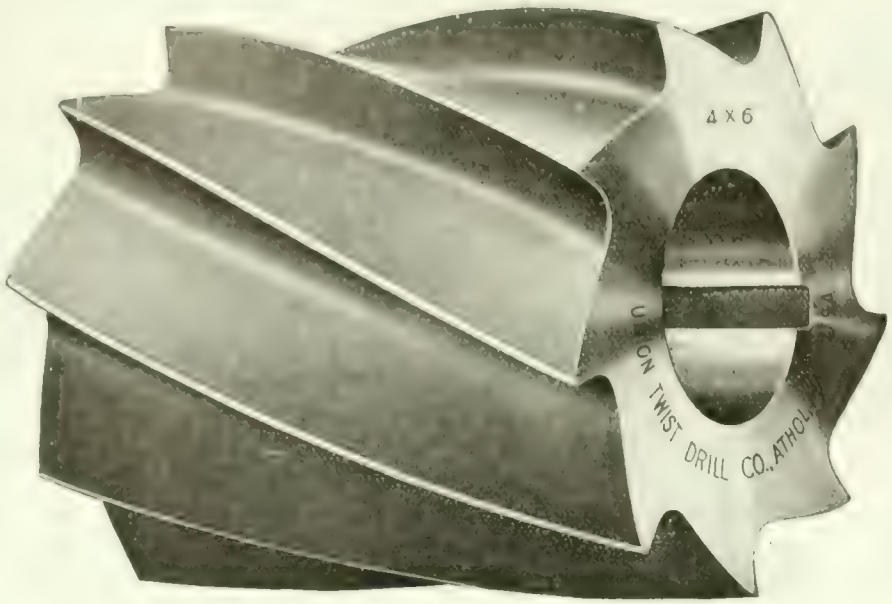
Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

Thwing Instrument Co.
34th Street and Lancaster Ave.,
PHILADELPHIA, PA.

Butterfield



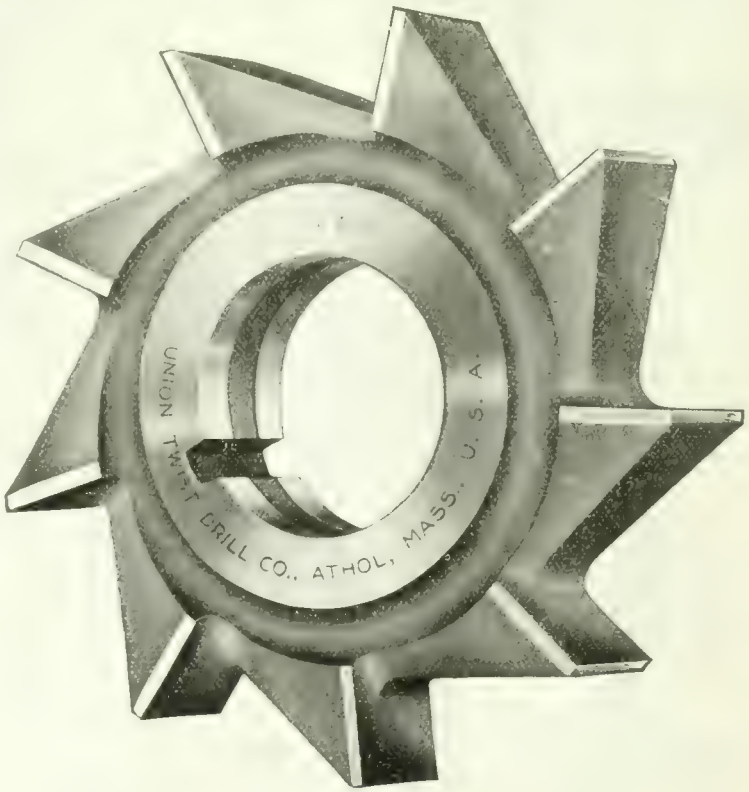
High Power Milling Cutters

Side Mills and End Mills

With Straight or Spiral Flutes, and Plain or Nicked Teeth.

We have the largest and most up-to-date factory in Canada, complete with the finest of special machinery and equipment for the manufacture of all kinds and styles of Carbon and High Speed Milling Cutters.

When you buy "Butterfield" Cutters you are assured of the same quality and accuracy put into our Taps, Dies and Reamers, and whether you require "Regulars" or "Specials," you will find our service prompt and efficient.



CATALOGUE?

Butterfield & Co.
Inc.

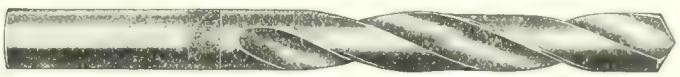
Rock Island, Que.
Canada

Butterfield

TWIST DRILLS

Carbon and High Speed
for Every Purpose

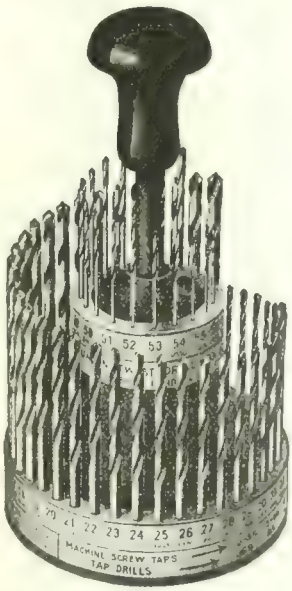
Butterfield Drills will give you the round, clean, accurate holes you have been looking for, with a minimum of grinding and absence of breakage.



Butterfield Drills are not an experiment. They are the result of long and careful investigation of the principles of "hole making."

To 99 men out of every 100 a twist drill is simply a tool for making holes; one is as good as another so long as the finish is equal. The beauty of a **Butterfield Drill** lies more than "skin deep," however.

Long and thorough research, combined with the most careful and exhaustive experimenting, has revealed to us the weak points in ordinary drill construction, and enabled us to produce a drill from which the faults and weaknesses of others have been eliminated.

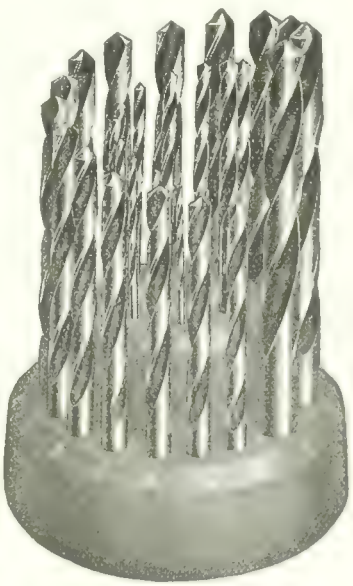


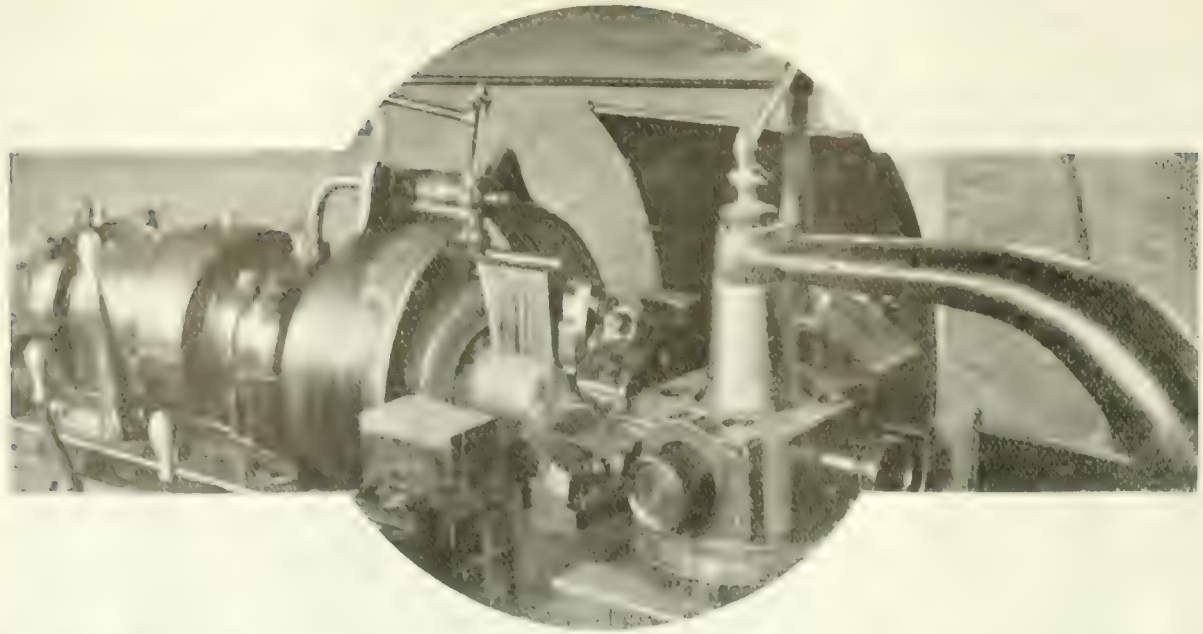
Butterfield Drills are manufactured on machines which embody the "last word" in mathematical accuracy and precision. Designed and used for the one purpose only, with the result that every finished drill is the nearest to perfection of any yet produced.

CATALOGUE?

Butterfield & Co.
Inc.

Rock Island, Que., Canada





MYSTIC CUTTING COMPOUND

A free-flowing, unsaponified animal oil lubricant. Does not separate in solution, grow rancid or cause rust. It is non-combustible and will not harm operator's hands.

Mystic Cutting Compound increases production and keeps tools in best of condition. Your machines need it. Your operators like it. Test it at our expense.

Cataract Refining Company, Limited - Toronto, Ontario

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

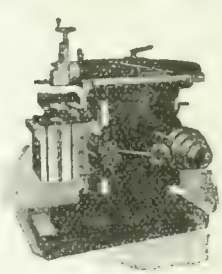
Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Increased Production Means Increased Profits

Large Millers for large work —STEPTOE MILLERS for small work.

Large Planers for large work —STEPTOE SHAPERS for small work.



Will result in increased production; less money invested in machinery, and increased profits.

THE JOHN STEPTOE COMPANY

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

The Right Heat

is the only heat to work with if you are going to turn out good work.

An ordinary mechanic can keep a Gilbert & Barker Furnace steady and even, insuring a uniform temperature.

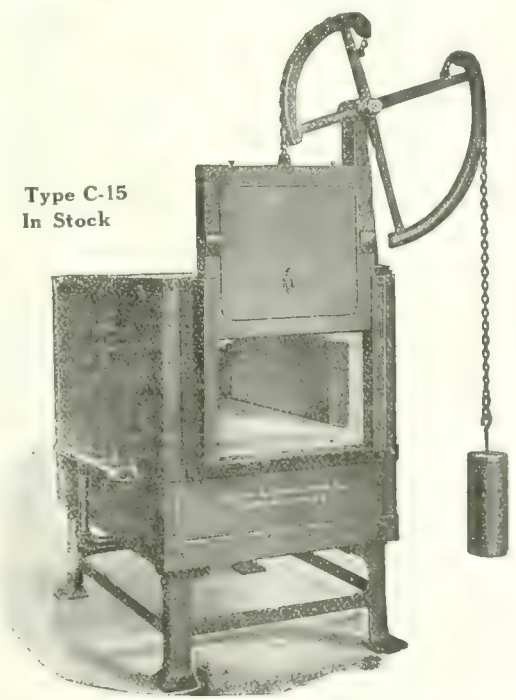
G. & B. are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counter-balanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality.

And in every G. & B. furnace you get the benefit of 52 years of experience and study with gaseous and liquid fuels. Our line includes more than one hundred types of furnaces.

At present we are making prompt delivery on many types. Stock list 21 describes them all.

Gilbert & Barker
Manufacturing Company
West Springfield, Mass.

Canadian Agents:
WILLIAMS & WILSON, LIMITED
Montreal, Que.
JAMES DEVON.
227 Davenport Rd., Toronto, Ont.



Type C-15
In Stock

Accurate and Easily Controlled Temperatures

This is absolutely essential in heat treating—carbonizing, annealing. With the Tate-Jones furnace shown here, you have not only this, but ease and economy of operation and a large output of perfect work as well.

Uniform temperature is accurately controlled by the burners and dampers and can be maintained indefinitely. Extremely short time of preparation and for the heating process speeds up the output and saves fuel.

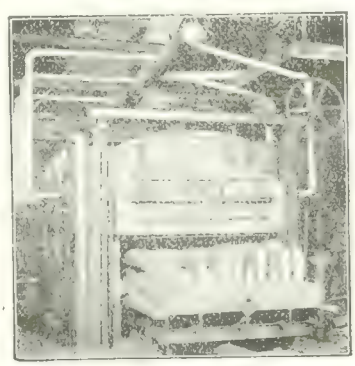
Made in car type and two types of stationary hearth—all firebrick and firebrick with cast iron bars imbedded in the top.

Complete information of these serviceable economical furnaces upon request.

We manufacture furnaces for all heat treating processes and allied operations.

TATE - JONES & CO. INC.
Established 1898
Furnace Engineers **Pittsburgh, Pa.**

Send for Bulletin



Car Type Overfired Annealing Furnace

The Only Grand Prize for TOOL HOLDERS

Awarded separately and independent of other lines exhibited at the

PANAMA-PACIFIC EXPOSITION

WAS WON BY

ARMSTRONG TOOL HOLDERS

HIGHEST AWARD

at 4 World's Expositons

Paris - - -	1900
St. Louis -	1905
Liege - - -	1904
San Francisco	1915

THEY ALWAYS MAKE GOOD

They Are Saving Millions of Dollars in High Speed Stee

CATALOG FREE

Armstrong Bros. Tool Co.

"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.

The Panama-Pacific MEDAL OF HONOR was also won by ARMSTRONG Drop Forged Wrenches, Ratchets, Clamps, Lathe Dogs, Etc.

Watch a Capable Mechanic Test a File—

See him pass his thumb over the teeth.

By instinct, he knows, at once, whether a file will do its work.

He senses, at once, the quality of the steel—its balance—and the sharp-edged teeth.

He makes no mistakes in buying—and his choice every time will be for "Famous Five" Files.

Be influenced by *his* judgment and specify "Famous Five" Files when ordering.

They are:

The Dominion Central Drawing Office

Do you have any rushed designs or tracings to make? Why not have same done by experts of

The Dominion Central Drawing Office

You don't require to keep a draughtsman when you find out how cheaply and how quickly it can be done by us.

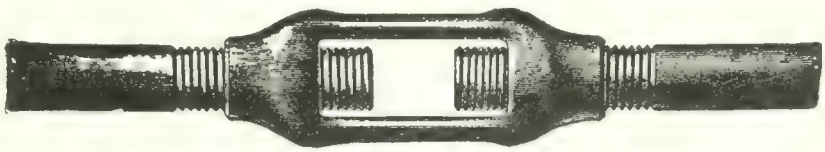
Are your draughtsmen in difficulties or doubt? Our experts can help them.

Consult us and save both time and money.

We specialize in all branches of Engineering, from Machine Tools to Bridges or Dockyards.

The Dominion Central Drawing Office
McGill Building, Montreal

Plyers, Structural Wrenches, Track Wrenches, Machine Wrenches, Eye Bolts, Lathe Dogs, Journal Box Wedges, Etc.



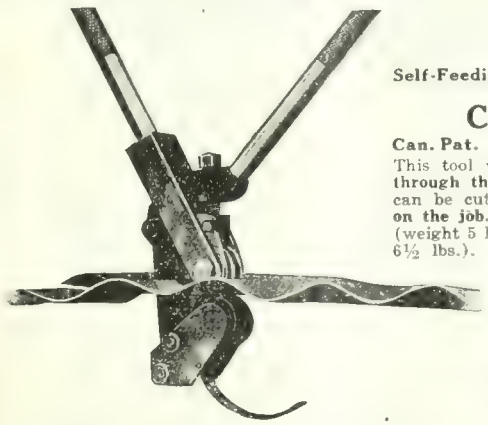
B
TRADE MARK

All Kinds Of Special Drop Forgings

Send Models or Blue Prints for Estimates

WRITE FOR CATALOG

Canadian Billings & Spencer, Limited, Welland, Ontario



TANGENT

Self-Feeding HAND TOOL FOR CUTTING Non-Distorting

CORRUGATED SHEETS

Can. Pat. No. 167666

This tool will cut sheets on any angle, limited curves and **through the centre** with **no distortion** of cut edges. Sheets can be cut to required shape when being **fixed in position on the job.** Made in two styles; as illustrated for 20 s.w.g. (weight 5 lbs.), with compound leverage for 18 s.w.g. (weight 6½ lbs.). Cuts 100% faster than any other hand method.

Write for Illustrated Pamphlet and Prices

Montgomery, Smith & Co., Ltd.
Patentees and Manufacturers
Tangent Works, Keynsham, Somerset, Eng.

Applications for selling agencies or rights to manufacture under license will be considered

PORTABLE

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

FIGHTING AVIATORS

possess a sixth sense that our scientists call the "sense of equilibrium."

It is this sixth sense that tells Ty Cobb the balanced weight of a baseball bat; the aviator he lifts it.

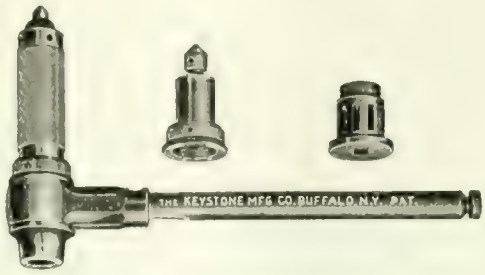
By this sixth sense certain skilled mechanics know the perfect balance of a tool. That these mechanics prefer to work with

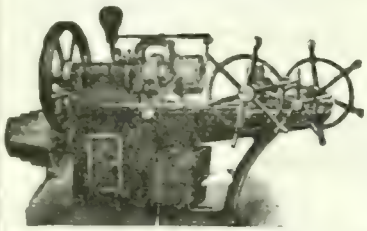
KEYSTONE TOOLS

we consider is a mark of high merit. That they, using their own money, buy and prize KEYSTONE TOOLS as a compliment that "Keystone Quality" shall everlastingly continue to be worthy.

Supplied by better wholesale houses everywhere. Write for name of nearest dealer.

The Keystone Mfg. Co.
Buffalo, N.Y., U.S.A.





BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

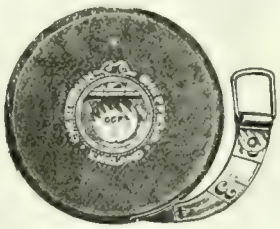
CANADIAN AGENT:
H. W. PETRIE, Ltd.
TORONTO, ONT.
MONTREAL, QUE.
VANCOUVER, B.C.

Measuring Tapes, Steel Rules, Straight Edges, Surveyors' Band Chains, Engineers' Tools

MANUFACTURED BY

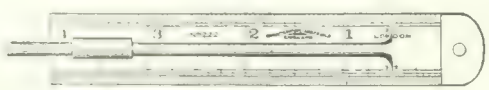
JAMES CHESTERMAN & CO., Limited

SHEFFIELD, · ENGLAND

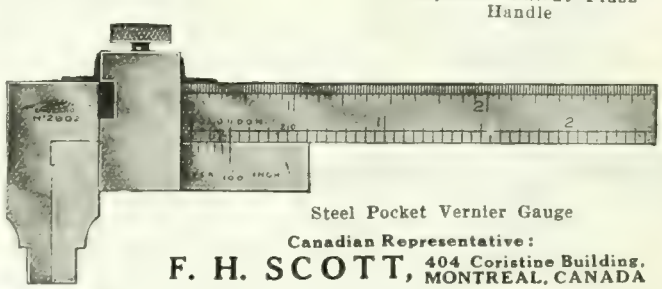


Wind-up Measures, Steel, Linen and Metallic. With Improved Patent Flush Handle

Chesterman tools are the highest standard of accuracy in the British Empire, and the quality of steel and substantial build guarantee a maximum of service and economy.



Steel Depth Gauge



Steel Pocket Vernier Gauge

Canadian Representative:
F. H. SCOTT, 404 Coristine Building, MONTREAL, CANADA

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

Clipper Belt Lacer Company
976 Front Avenue Grand Rapids, Mich.

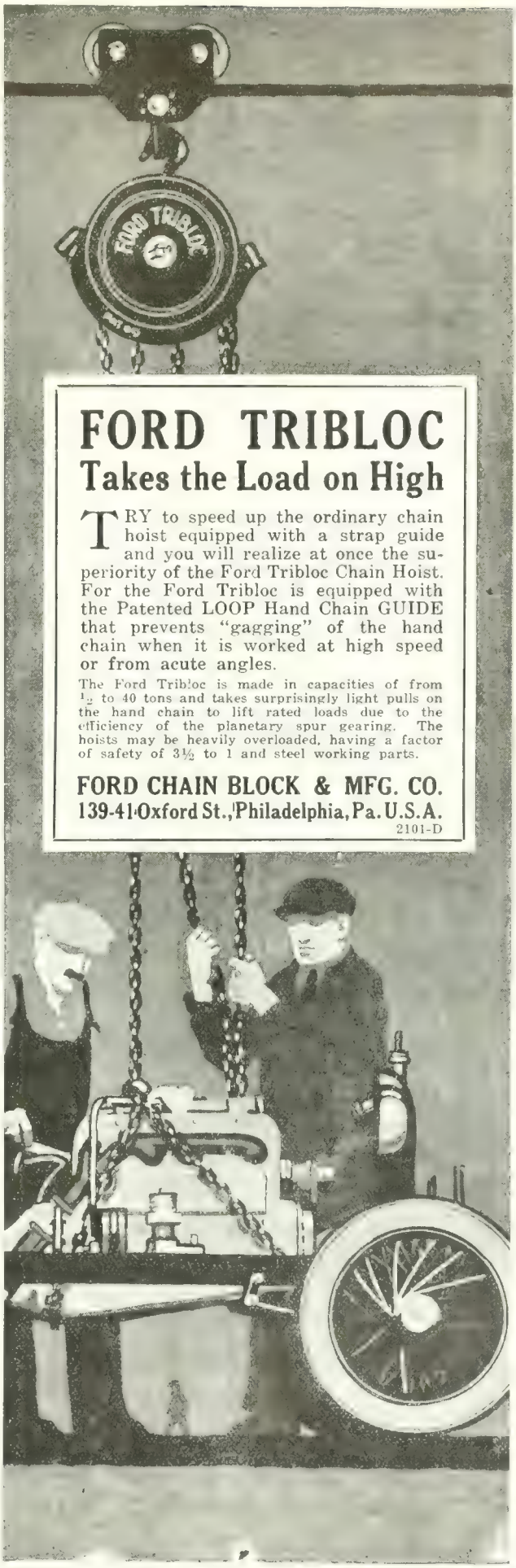
FOR PIPE OR NUT HARD TO REACH WITHOUT IT

Easily opened or closed to a slipless grip by the thumb of the hand that operates it, this B. & C. "S" Wrench is specially designed for pipe and nut work otherwise hard to reach.

Sliding jaw is a steel drop forging; operating nut is steel, and all parts are interchangeable. Ask for Catalog of B. & C. made-right wrenches.

BEMIS & CALL
Hardware & Tool Company
Springfield, Mass., U.S.A.

TRADE B&C MARK



FORD TRIBLOC
Takes the Load on High

TRY to speed up the ordinary chain hoist equipped with a strap guide and you will realize at once the superiority of the Ford Tribloc Chain Hoist. For the Ford Tribloc is equipped with the Patented LOOP Hand Chain GUIDE that prevents "gagging" of the hand chain when it is worked at high speed or from acute angles.

The Ford Tribloc is made in capacities of from ½ to 40 tons and takes surprisingly light pulls on the hand chain to lift rated loads due to the efficiency of the planetary spur gearing. The hoists may be heavily overloaded, having a factor of safety of 3½ to 1 and steel working parts.

FORD CHAIN BLOCK & MFG. CO.
139-41 Oxford St., Philadelphia, Pa. U.S.A.
2101-D

Its Results Are So Sure—

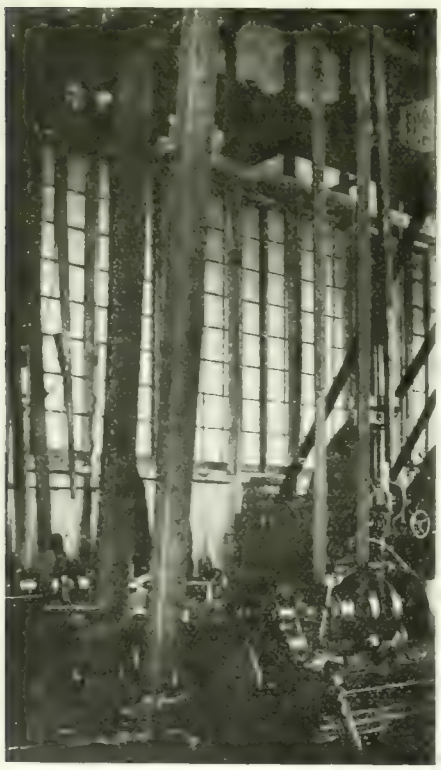
You, Too, Should Be Using It

The Hanover Portland Cement Co.
Hanover, Ont.

"Our last order was for two 12-inch belts and one 14-inch. They were used to replace belts on cement mill drives where operating conditions are as you know, rather severe. The 12-inch belts have never been touched since putting on, and there is [illegible] **no stretch.**

"The 14-inch Belt is transmitting 60 H.P. in the grinding department, and was put on with a defective pulley which caused the belt to run against the concrete floor. Rather than shut down the mill the belt was operated in this way until a new pulley could be obtained, some two weeks the belt at the end of that time had worn off three-eighths of an inch on the edge, but there was absolutely **no ply separation** or apparent damage to the belt whatever, other than the wear on the edge.

"The writer has no hesitation in saying that as far as his experience goes, there is no belt seems so well adapted for cement mill service as 'Extra Power'."



GOODYEAR has claimed for Extra Power Belting many unusual advantages. These claims touch belting superiority at every angle.

To be specific—Goodyear has claimed that Extra Power has longer life and so reduces belting expense. Even on hard drives, this claim holds good. And we have claimed that, in addition, this new basis belt delivers more of the power the plant develops.

Extra Power has now been in use in every kind of factory, on small drives, ordinary drives, hard drives—long enough for all to know whether our unusual claims prove true.

From manufacturers in every line of industry letters have come telling of the success of Extra Power — of service beyond all expectations — of economy past all anticipation—of **satisfaction,** thorough and unqualified.

The testimony of The Hanover Portland Cement Co., given at the side of this advertisement, is but one sample of many recounting the same experience with Extra Power—lasting, more economical service.

The scientific, uniform construction of Extra Power makes its results so sure that we urge you, too, to adopt it.

Wouldn't it be good business to trust to Extra Power to prevent costly shut-downs and delays—to earn its cost by increasing production by yielding better transmission?

Let a trained Goodyear belting specialist call on you and discuss your belting problems. A postcard or telephone call to our nearest branch will bring him.

The Goodyear Tire & Rubber Co., of Canada, Limited

Branches: **Halifax, St. John, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Calgary, Edmonton, Vancouver.**

Service stocks in smaller cities.

EXTRA POWER Belting

MORSE
SILENT CHAINS

The Only 99% Efficient Power Transmission

FROM 1/4 H.P. TO 5000 H.P.
THEY MAKE GOOD

Let MORSE Engineers Design Your New Drive

Only by using MORSE CHAINS can you get the MOST out of your Machines and Motors

The MOST is little enough just now.

POWERFUL
SILENT ENDURING

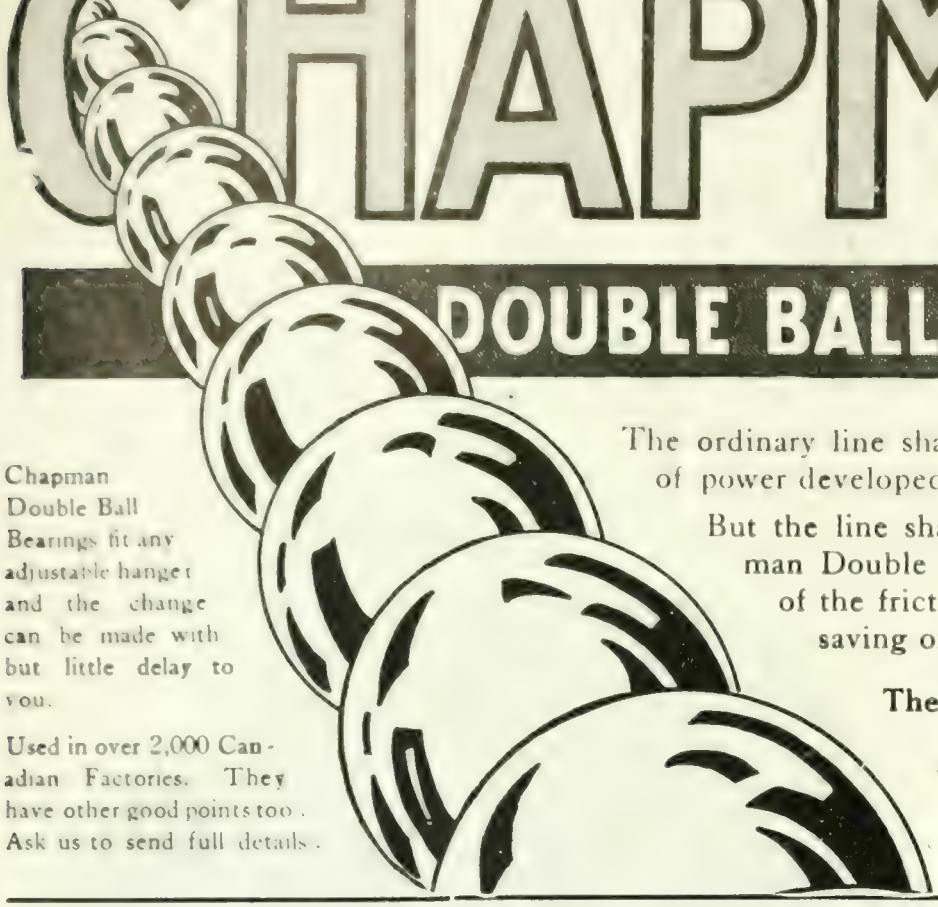
MORSE CHAIN COMPANY, Ithaca, N. Y.

The Largest Manufacturers of Silent Chains in the World

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

CHAPMAN

DOUBLE BALL BEARINGS



Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED

Electric Travelling Cranes

(Direct or Alternating Current)

Steam and Electric Derricks

(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.
ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited

MONTREAL

FOR PHOSPHATE PLANTS

LAKELAND PHOSPHATE COMPANY,
Lakeland, Fla.

Magnolia Metal Co., Nov. 4, 1916.
New York City,
Gentlemen:

I have been a user of Magnolia Metal for a number of years, using it in the kaolin and phosphate business, and have always found it to give better results than any other frictionless metal that I have used, and always specify it for repairs and new equipment.

Yours very truly,
G. O. LONG, Chief Engr.

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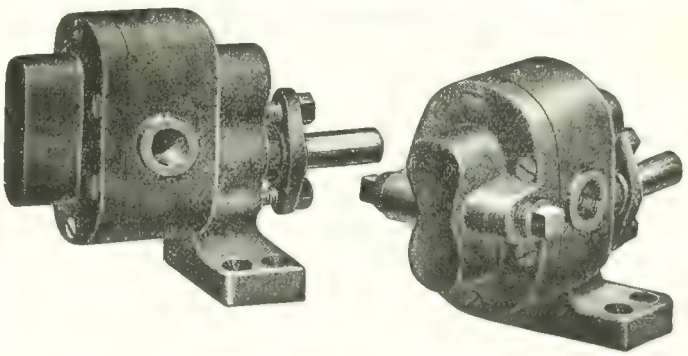

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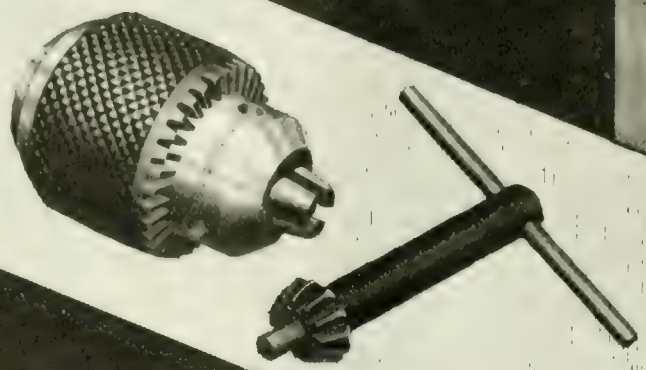

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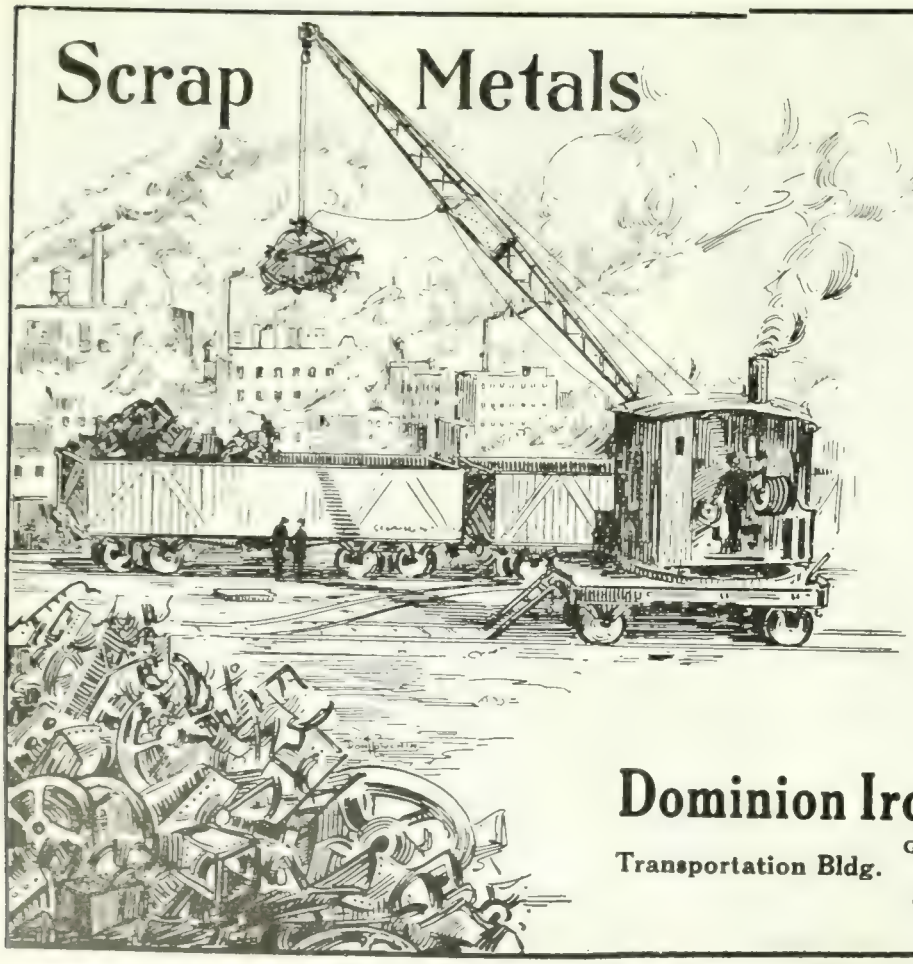

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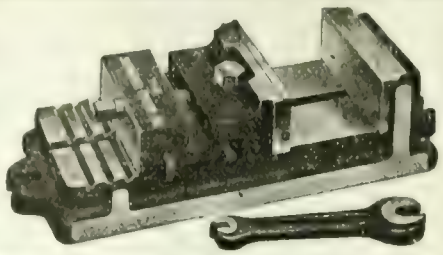

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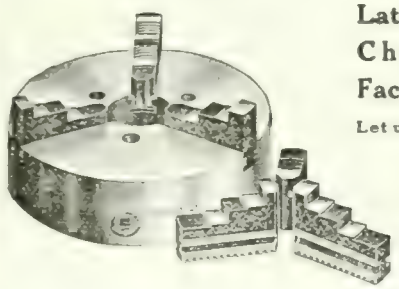

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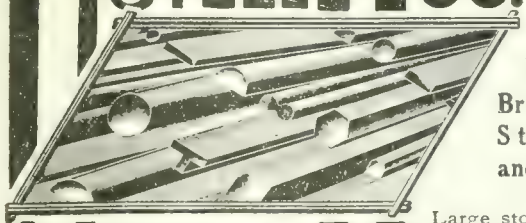

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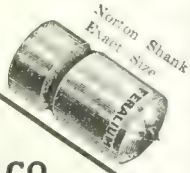

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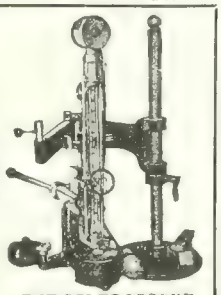

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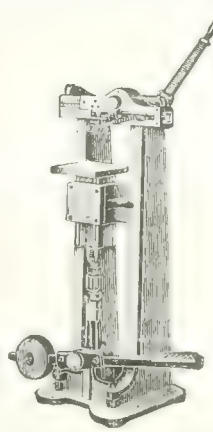

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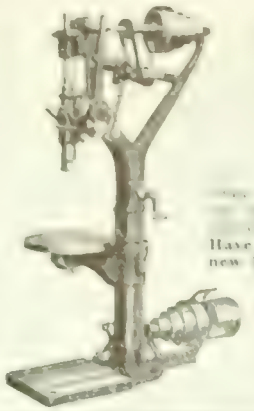

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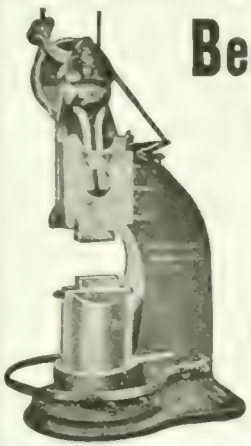

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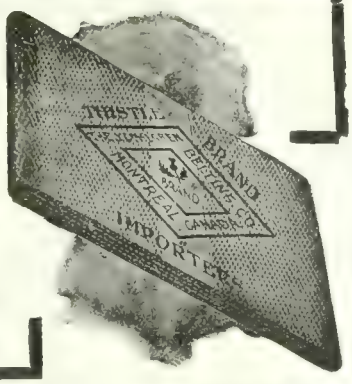

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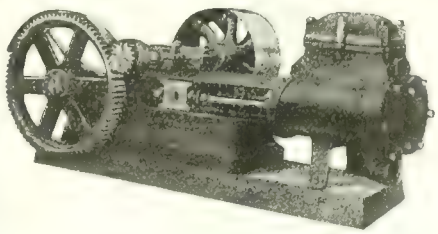

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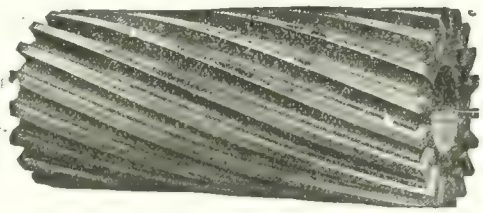

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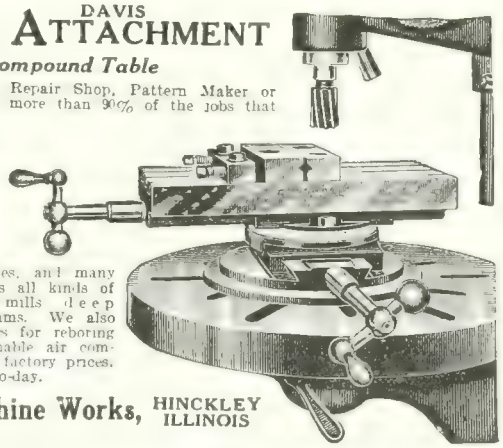

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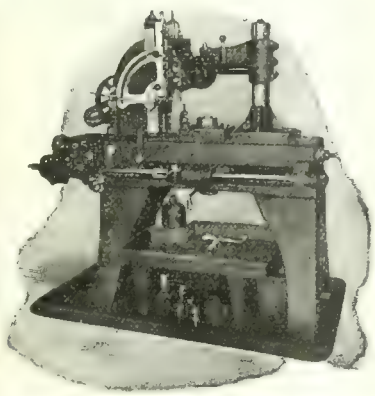

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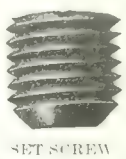

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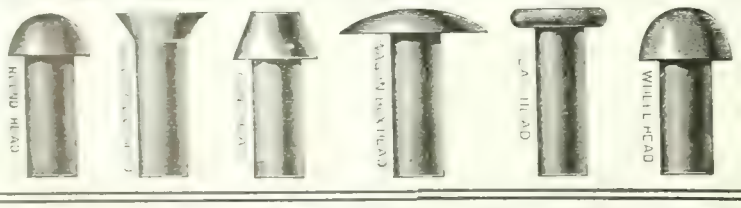

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AIR WASHERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

ALUMINUM
Canada Metal Co., Toronto
Tallman Brass & Metal Co., Hamilton

ALLOY, STEEL
Can. B. K. Morton, Toronto, Montreal
H. A. Drury Co., Ltd., Montreal
Hawkridge Bros. Co., Boston, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
McClean & Son, F. W., Niagara Falls, Ont.
Riverside Machinery Depot, Detroit, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
A. R. Williams Machy. Co., Toronto

BABBITT METAL
Aikenhead Hardware Co., Toronto, Ont.
Baxter & Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Ltd., Toronto
Can. B. K. Morton, Toronto, Montreal
Foss & Hill Machy. Co., Montreal.
Hoyt Metal Co., Toronto
Magnolia Metal Co., Montreal
Petrie, Ltd., H. W., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton
Wilkinson & Kompass, Hamilton, Ont.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal
Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Charles F. Elmes Eng. Works, Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Niles-Bement Pond Co., New York

BASE PLATES
Jas. McKay Co., Pittsburgh, Pa.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT DRESSING AND CEMENT
Baxter & Co., Ltd., J. R., Montreal, Que.

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, BALATA
Baxter Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal
Federal Engineering Co., Toronto, Ont.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
Goodyear Tire & Rubber Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
Jones & Glassco, Montreal
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter & Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

BENDING MACHINERY
John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. R., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BINS, STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.
U. S. Silica Co., Chicago, Ill.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mulliner-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Marsh & Henthorn, Ltd., Belleville, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Sterling Engine Works, Winnipeg, Man.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS FOUNDERS
St. Lawrence Welding Co., Montreal, Que.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BUBBLERS
Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.

BUCKETS, CLAM SHELL, CRAB, DUMP
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BULLDOZERS
Canada Machinery Corp., Galt, Ont.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville, Ont.

BURRING REAMERS
Wells Bros. Co. of Canada, Galt, Ont.

BURRS, IRON AND COPPER

CANNERS MACHINERY
Burt F. Webber Co., Rochester, N.Y.
Northern Crane Works, Ltd., Walkerville, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CARS, STEEL BODY
Canada Car Co., Ltd., Montreal, Que.

CAR MOVERS
Ottawa Car Co., Ltd., Ottawa, Ont.

CARTRIDGE MAKING MACHINERY
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Acme Metal Products, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Taylor-Wilson Mfg. Co., Three Rivers, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Acme Metal Products, Ltd., Ottawa.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Pressaville Foundry Co., Pressaville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAIN DRIVES
Jones & Glassco, Montreal, Que.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Sawyer Chuck Co., New Britain, Conn.
D. E. Whitcomb Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Wessman Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Vulcan Tool Co., Worcester, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Sheeter, 55 New Birks Bldg., Montreal.

CHUCKS, RING, WHEEL
Lees-Bradner Mach. Co., Hamilton, Ont.
Gisholt Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Reed Taylor & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Rockford Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
Mead & Harrison, Ltd., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Slocomb & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COMPRESSORS, AIR
Can. Ingersoll Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTRACT WORK
Welland Motor & Machine Co., Welland, Ont.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerville.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Petrie, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Marsh & Henthorn, Ltd., Belleville, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada, Galt, Ont.

DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

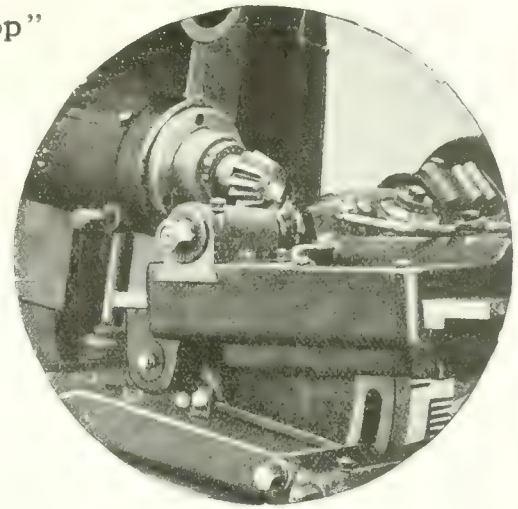
DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

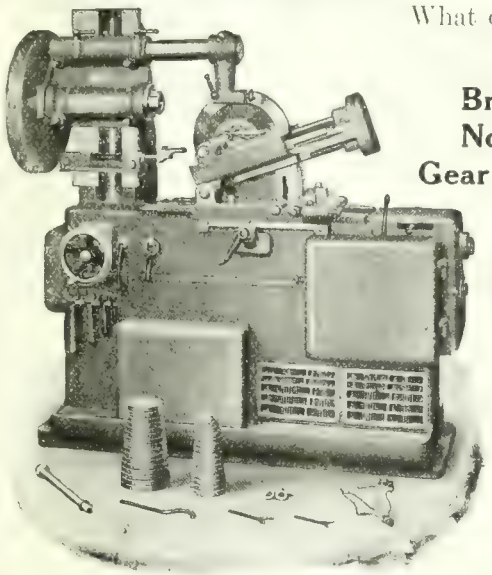
"Built to Stand the Steady Drive of the Busy Shop"

How the Foreman Solved the Problem

He didn't use enough spur gears to warrant putting in a spur gear cutting machine. Neither did he use enough bevel gears to make the installation of a bevel gear cutter a profitable investment.

What did he do?





He installed a Brown & Sharpe No. 13 Automatic Gear Cutting Machine

because it gave him the equipment necessary to cut both spur and bevel gears as well as sprockets and clutches all in one machine. No more waiting for gears. No more delays. And no machines to lie idle through lack of work.

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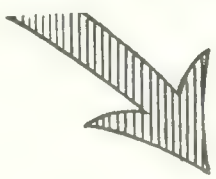

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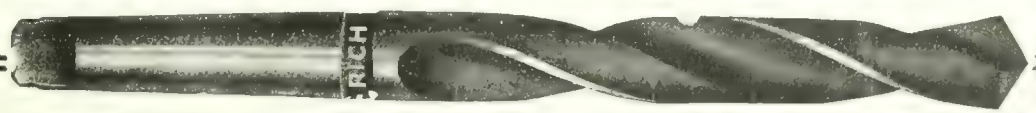

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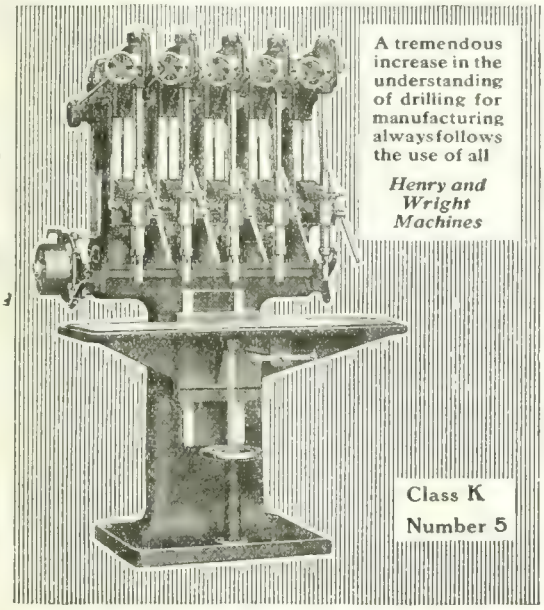

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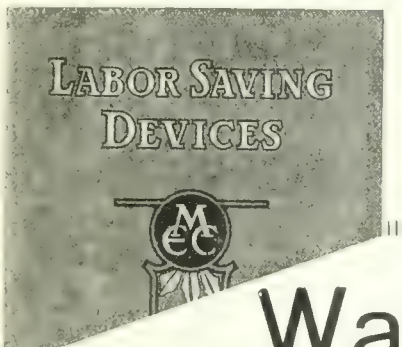

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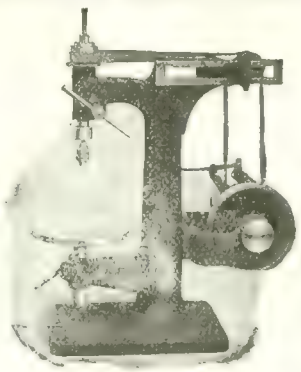

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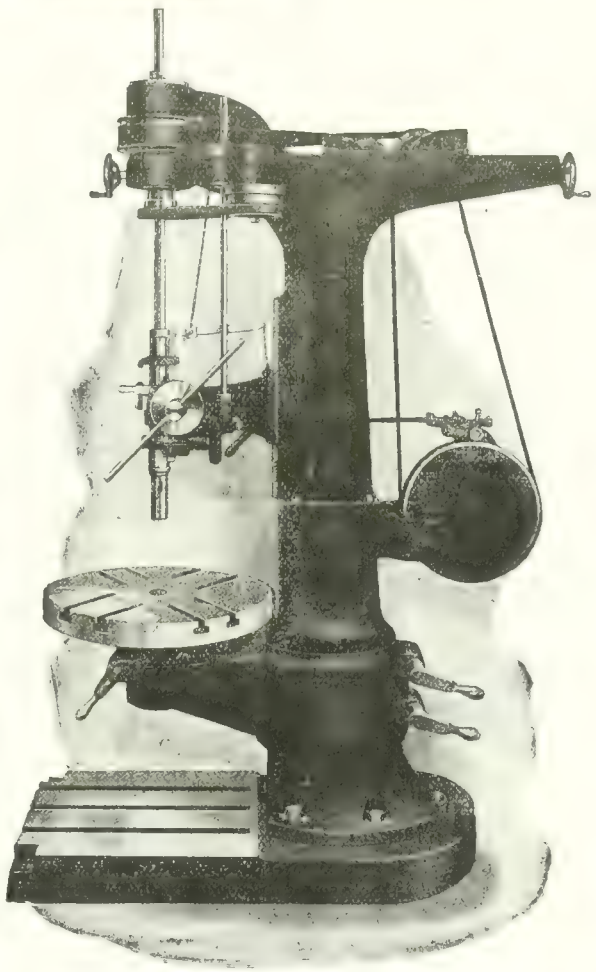

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
[illegible]
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United States Electrical Tool Co., Cincinnati, O.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilmarth & Morman, Grand Rapids, Mich.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Greenfield Machine Co., Greenfield, Mass.
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Independent Pneumatic Tool Co., Chicago, Ill.
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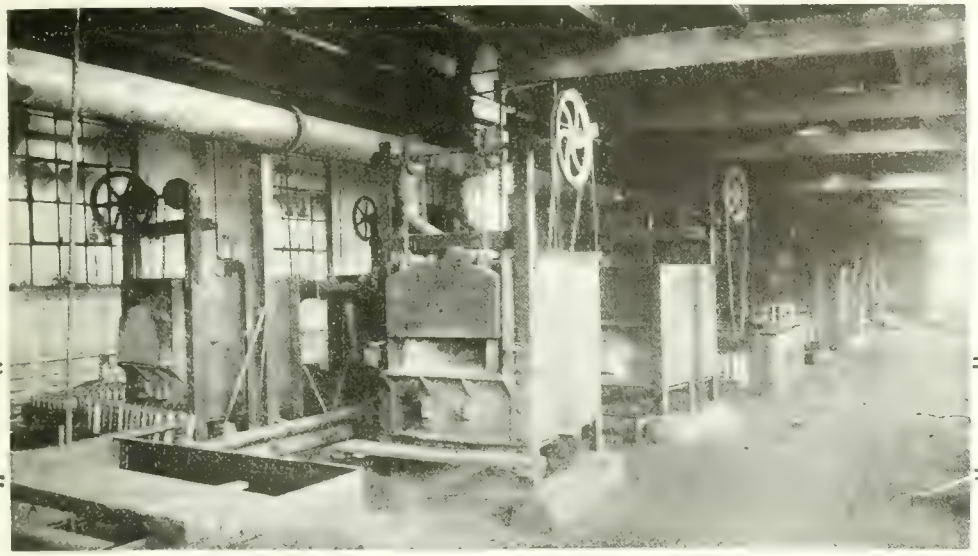

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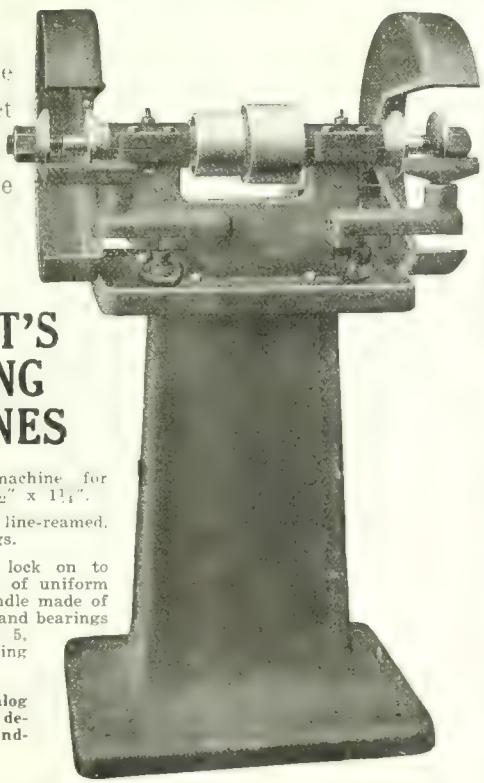

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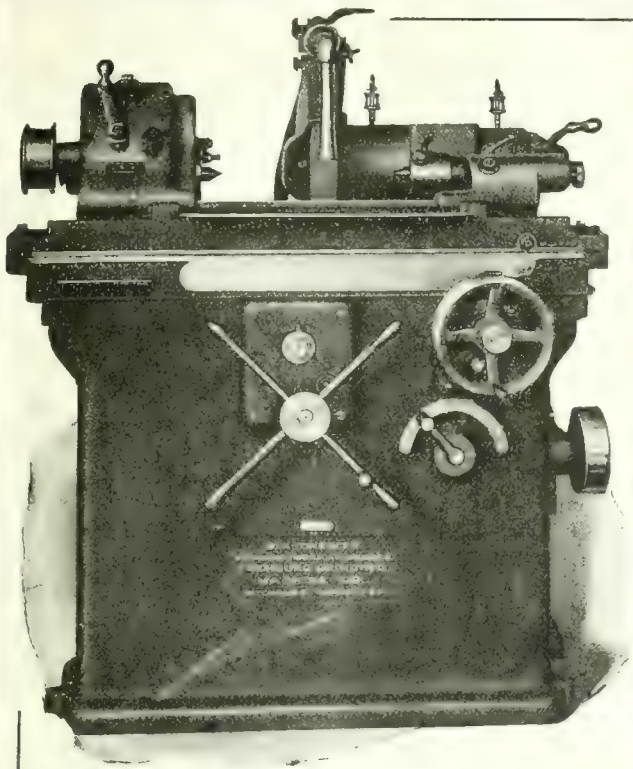

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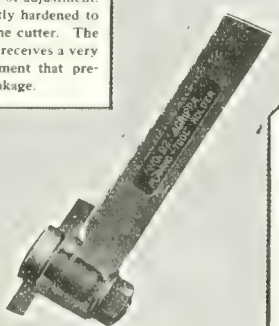

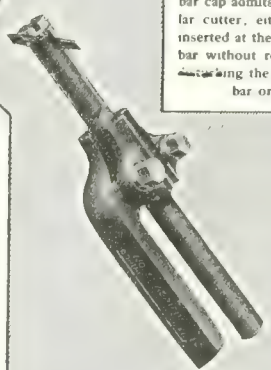

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RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.

RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

RIVET MACHINES
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

ROLLER CHAINS
Jones & Glassco, Montreal.

ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

ROLLS, CRUSHING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland

RULES
Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.

SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

SAWS, CIRCULAR METAL
Hunter Saw & Machine Co., Pittsburg, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.

SCREW MACHINE PARTS
Johnson Mach. Co., Carlyle, Manchester, Conn.

SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.

SCREWS
Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.

SECOND-HAND MACHINERY
Davis Machine Tool Co., W. F., New York
Dominion Machinery Co., Toronto
Foss & Hill Machy. Co., Montreal
Hill, Clarke & Co., Chicago, Ill.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.
Wilkinson & Kompass, Hamilton, Ont.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas
Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio

SHAFTING
Can. Bond Hanger & Coup. Co., Alexandria, Ont
Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sterling Engine Works, Winnipeg, Man.
Strelinger Co., Chas. A., Detroit, Mich.
A. R. Williams Machy. Co., Toronto
Wilkinson & Kompass, Hamilton, Ont.

SHAFTS, FLEXIBLE
Stow Mfg. Co., Binghampton, N.Y.

SHARPENING STONES
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

SHAVINGS, SEPARATOR
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

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John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo
SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferracute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo
SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.
SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada
SHEET METAL WORKING TOOLS
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Steel Bending Brake Works Ltd., Chatham, Ont.
SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.
SHELL BANDING MACHINES, HYDRAULIC
Garlock Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.
SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.
SHELL TOOLS
Marsh & Henthorn Ltd., Belleville, Ont.
SHRAPNEL SHELL MARKER
Brown, Boggs & Co., Hamilton, Canada
Noble & Westbrook Mfg. Co., Hartford, Conn.
SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.
SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.
SILENT CHAINS
Jones & Glassco, Montreal
SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.
SKATE SHARPENERS
Can. Ball Hanger & Cplg. Co., Alexandria, Ont.
SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williamson & Kempson, Hamilton, Ont.
SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.
SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
Marsh & Henthorn Ltd., Belleville, Ont.
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Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.
SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.
SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada
SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bandield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Bronx Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Eklund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Gray Mfg. & Mach. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.
SPEED REDUCING GEARS
Jones & Glassco, Montreal
SPRINGS, MACHINERY
Bliss, Wallace Co., Bristol, Conn.
Can. Steel Foundries Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele Ltd., Guelph, Ont.
SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.
SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.
SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
SOLDER
Jobborn, Geo. A., Hamilton, Ont.
Jones & Glassco, Montreal
SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.
STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.
STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.
STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.
STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.
STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart Turner Machine Co., Hamilton
Sturtevant Co., B. F., Galt, Ont.
STEEL ALLOY (SEE ALLOY STEEL)
STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.
STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.
STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.
STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.
STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.
STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.
STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.
STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.
STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.
STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.
STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.
SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.
TACK (DOUBLE POINT) MACHINES
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
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TAPPING MACHINES AND ATTACHMENTS
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Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Wells Bros. Co. of Canada, Galt, Ont.
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TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.
THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
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Gray Mfg. & Mach. Co., Toronto, Ont.
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Brown, Boggs & Co., Hamilton, Can.
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William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.
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Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.
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Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
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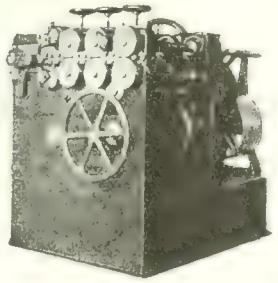

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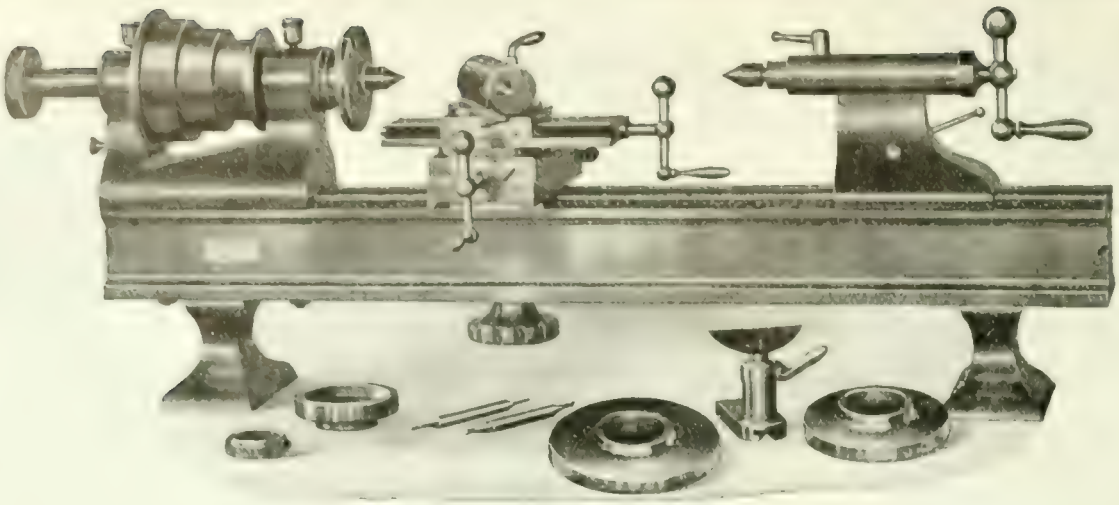

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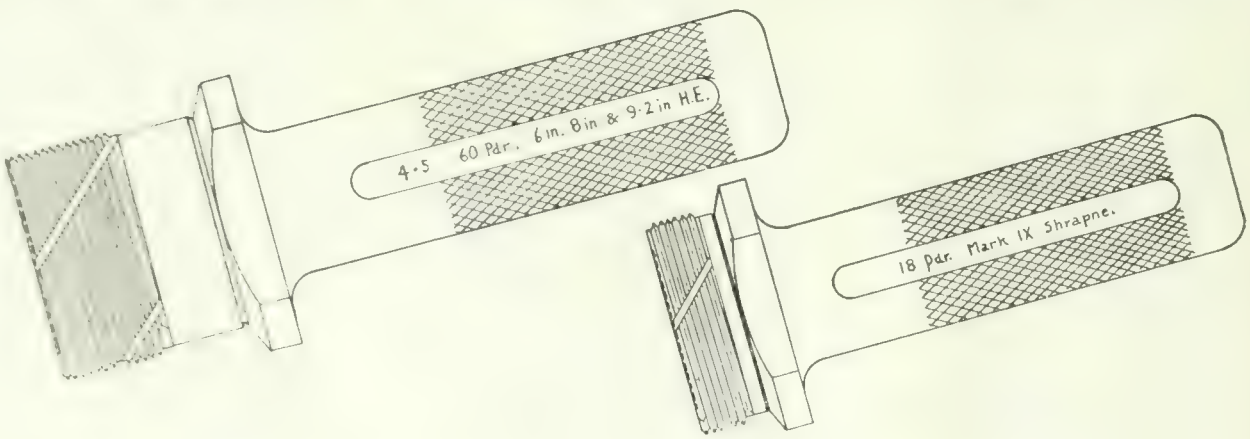

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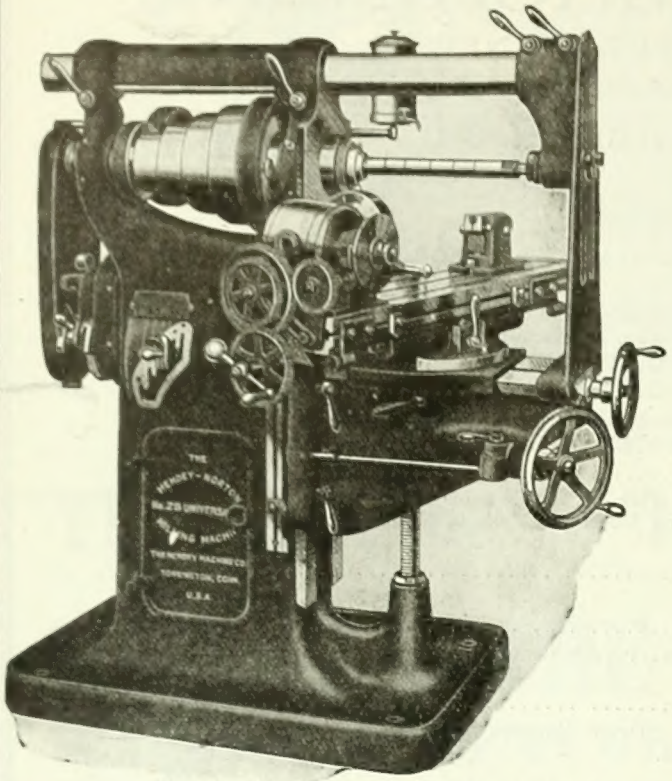

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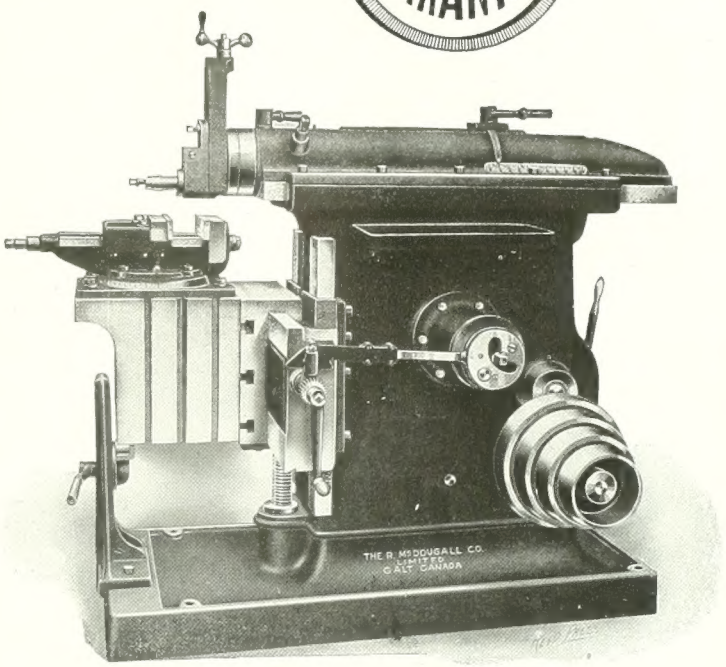

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1—No. 4 Foster Screw Machine
1—No. 6 Foster Screw Machine
1—1" Hercules Screw Machine
1—Fay & Scott Bed Turret for 24" Lathe
4—21 x 8 Le Blond Turret Lathes
4—21 x 8 Le Blond Turning Lathes

1—24" Sidney Sliding Head Drill Press
1—26" Sidney Sliding Head Drill Press
1—28" Sidney Sliding Head Drill Press
1—30" Sidney Sliding Head Drill Press
1—20' Ohio Heavy Duty Shaper
1—20' Smith & Mills Shaper
1—20' Queen City Shaper
1—No. 1 Fraser Convertible Cutter and Tool Grinder
1—No. 2 Oesterlein Universal Cutter and Tool Grinder
1—No. 3 Oesterlein Universal Cutter and Tool Grinder

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